MARTEL
ELECTRONICS

BETA
CALIBRATORS

GENERAL
CATALOG

Calibration Technology Starts Here!

Volume 2, Issue 1

Martel Electronics offers a diversified line of hand held and bench calibrators, process instruments, process indicators, and power supplies manufactured to the highest quality standards for the process industry and OEM applications.

Throughout our growth, we have maintained our small business, customer-oriented approach in all phases of product development, manufacturing, quality control and after sales service. Computer aided design, in-house software and surface mount capability enable Martel to offer "smart products in small packages", and maintain cost effective manufacturing practices. Everyone at Martel is actively engaged in quality control, to assure that only the highest quality materials and components are used - and that they receive the most reliable products available.

OEM SERVICES

As a strategic partner to some of the leading OEM's serving the process industry, Martel provides them with a proven source of innovative product development that results in a product incorporating the very latest technology, and built to Martel's high quality standards, all within a realistic time frame.

Call us today for full details on our custom product design and manufacturing services to enhance your existing product line.

Specifications subject to change without notice.

Our product line on the following pages is presented in the following order:

★ NEW ITEMS

PRESSURE CALIBRATORS

Feature	BetaGauge 330	BetaGauge 311A	BetaGauge 321A	BetaGauge 311A-EX	BetaGauge 321A-EX	BetaGauge PI-PRO	BetaGauge PIR-PRO	BetaGauge 301	BetaGauge II	T-140 Digital Manometer	DPC-30 DPC-100	DPC-300A
Single (S)/dual (D) range	S	S	D	S	D	S	S	S	D	S	S	S
External pressure module	•	•	•					•	•			•
Basic pressure accuracy[1]	0.025	0.025	0.025	0.025	0.025	0.05	0.04[2]	0.05	0.025	0.05	0.05	0.025[2]
DC V measurement	•	•	•					•	•		•	•
DC mA measurement	•	•	•	•	•			•	•		•	•
RTD measurement	•	•	•	•	•							
Integral pump (electric)	•											•
Integral pump (manual)	•											
Loop power (24 VDC)	•	•	•					•			•	•
Switch test	•	•	•	•	•			•	•		•	•
Lowest range (in psi)	30	0.4	0.4	0.4	0.4	0.4	30	1	0.4	0.4	30	100
Highest range (in psi)	300	10,000	10,000	10,000	10,000	10,000	10,000	300	10,000	3,000	100	300
Absolute available	•	•	•	•	•	•			•			
Differential available		•		•					•	•	•	•
Data logging						•	•					
Intrinsically safe				•	•	•	•		•			
Internal range selection	5	27	23	27	23	18	8	5	27	6	1	1
# of engineering units	15	19	19	19	19	23	23	19	14	14	13	15
Custom engineering unit	•	•	•	•	•	•	•	•	•			•
Catalog Page	4-5	6-7	6-7	8-9	8-9	12-14	15	20	18	21	22	10-11

SIGNAL CALIBRATORS

Feature	3001	M2000A	T-150	DMC-1410	MC-1210	MC-1010	PTC-8010	PSC-4010	LC-110(H)	BetaProbe	TC-100	IVC-222 HPII	MS-420
Bench top	•	•											
Panel mount	•	O	O	O	O	O	O						
Power[3]	AC	AC	9V	4 AA	4 AA	4 AA	4 AA	4 AA	6AAA	3AAA	9V	9V	9V
Dual channel	•			•	•								
Isolated readback channel	•			•	•								
Documenting / Data Log				•					•	•			
Accuracy Class	30 ppm[2]	30 ppm[2]	±0.01%	±0.01%	±0.015%	±0.015%	±0.015%	±0.015%	±0.01%	±0.06°C	±0.007%	±0.015%	±0.075%
DC Voltage Measure	•			•	•	•	•	•	•	•			
DC Voltage Source	•	•	•	•	•	•	•	•	•			•	
DC Current Measure	•			•	•	•			•	•			
DC Current Source	•	•		•	•	•			•			•	•
Thermocouple Measure	•			•	•	•	•				•		
Thermocouple Source	•			•	•	•	•				•		
RTD Measure incl. Ω	•			•	•	•	•			•			
RTD Source incl. Ω	•			•	•	•	•						
Pressure (optional)	•			•	•	•		•					
Frequency Measure			•	•	•	•	•						
Frequency Source			•	•	•	•	•						
Loop power (24 VDC)	•		•	•	•	•		•					
HART™ resistor	•			•	•	•			•	•			
HART™ Diagnostics										•			
Catalog Page	30-32	33-34	35	26-29	26-29	26-29	26-29	26-29	36-37	38-39	40-41	42	43

1 = % of full scale except as noted
2 = % of reading ± 0.01% of full scale

O = with optional kit
3 = AC or number/type of Alkaline batteries

The BetaGauge 330-300e

The BetaGauge 330 is a revolution in pressure calibration technology for the process industries. With the 330, technicians have a small, lightweight calibrator that generates from high vacuum to 300 PSI using a high performance integral electric pump.

Gone is the drudgery of manual pumping or using large, heavy and unwieldy boxes with limited portability and poor battery life.

The BetaGauge 330 has a form factor only slightly larger than Martel's popular BetaGauge 321 and weighs in at a mere 2.5 pounds. The housing is contoured to easily fit a technician's hand with good balance top to bottom.

Performance doesn't stop with the pump. The BetaGauge 330 provides ±0.035% of full scale accuracy on its internal, isolated pressure sensor. Temperature compensation on its internal sensor ensures accuracy in field applications. An external pressure module connection supports all 29 ranges of BetaPort-P pressure modules for even greater measurement capability.

A Pt100 RTD input is provided for temperature measurements accurate to ±0.1 °C (0.2 °F). In addition, the BetaGauge 330 measures and simulates 4-20 mA loop current signals. It can measure up to 30 VDC. An internal 24 VDC Instrument Power Supply supplies power to a transmitter under test.

Like its calibrator siblings, the 330 displays up to 3 calibration values at one time from the choice of internal pressure sensor, external pressure sensor, temperature from the optional RTD probe or electrical (mA or VDC). The display is a large back lit graphics style LCD that's easy to read in any lighting condition.

The new BetaGauge 330 Pressure Calibrator provides a number of convenience features. Switch test can be performed on internal or external pressure input. Percent (%) Error and damping functions are provided. Up to five frequently used setups can be stored and retrieved with one button recall.

The compact, rugged design operates on eight (8) standard AA Alkaline batteries. Due to the power saving designs incorporated in the BetaGauge 330, it can perform approximately 300 calibration cycles to 150 PSI on one set of batteries or 100 cycles to 300 PSI.

The 330 comes in 5 ranges of 30 PSI, 150 PSI and 300 PSI gauge and 30 PSI and 150 PSI absolute.

Like all Martel calibrators, the BetaGauge 330 comes from the factory ready to go to work with batteries installed, NIST traceable calibration certificate, test leads, connection hose, fittings, deluxe carrying case and user manual.

**BETAGAUGE 330
Hand Held
Pressure Calibrator
with Integral Electric
Pressure Pump**

LDT-500 Martel/BETA Pneumatic Dirt/Moisture Trap
The LDT-500 is a Dirt/Moisture Trap that is used in pneumatic applications to protect valuable assets such as sensors, pumps, or calibrators from damage. It features a 1/8" MNPT Outlet connection with o-ring seal and a Universal (1/8" NPT Female or 1/8" BSP Female Thread). The trap is designed to be used in a vertical position and can handle up to 500 PSIG/35 Bar. The latest version features a vent valve and hose, so the end user does not have to remove the trap if there is moisture built up in the clear acrylic chamber.

Cleaning/Assembly is handled by simply unscrewing the top section of the chamber and removing the two o-rings.

**BETA LDT-500 Dirt/Moisture Trap
with Vent Valve**

Media Compatibility: Electroless Nickel over Brass, Acrylic, Cast Urethane and Nitrile (Buna-N) O-Ring seals.
Size: 2.5" x 1" (L x W) - Weight: 5 ounces
Connections: 1/8" MNPT x (1/8" FNPT or 1/8" FBSP)

with Integral Electric Pressure Pump

General Features

- Integrated internal electrically operated pneumatic pump: generates pressure to 300 PSI and vacuum to -12 PSI (-0.8 to 20 Bar, -80 to 2000 kPa)
- Accuracy of 0.035% FS
- Small rugged compact design operates on eight (8) standard Alkaline AA batteries
  - Only 8" high x 4" wide x 2-3/8" deep (20 cm x 10 cm x 6 cm)
  - Lightweight at just 2.5 pounds (1.2 kg)
- External pressure module interface supports all BetaPort-P pressure modules (requires optional BPPA-100 module adapter)
- Pt100 RTD input for temperature measurement, accurate to 0.2°F (0.1°C) (measurement only)
- 24 V loop power to power device under test
- Store and recall 5 user defined setups
- Clearbrite LCD with backlight can be configured to display up to 3 variables displayed simultaneously (user controlled)
- Ideal for gas custody transfer flow meter applications
- Pressure displayed in the user's choice of 15 engineering units
- Switch test is automatic using internal sensor or external pressure module
- IP51 Rated
- Percent error function

BetaGauge 330 Ordering Information

Part Number	Description
1919793	BetaGauge 330-30, 30 psi/2 bar internal range, battery operated internal pump
1919782	BetaGauge 330-150, 150 psi/10 bar internal range, battery operated internal pump
1919919	BetaGauge 330-300e, 300 psi/20 bar internal range, battery operated internal pump
1919882	BetaGauge 330-30A, 30 psi/2 bar ABSOLUTE internal range, battery operated internal pump
1919883	BetaGauge 330-150A, 150 psi/10 bar ABSOLUTE internal range, battery operated internal pump
	All units above include • LDT-500 liquid/dirt trap • Batteries • Test leads • Test hose & fittings • NIST traceable calibration certificate • User guide • Deluxe soft sided carrying case
Custody Transfer Calibration Kits	
1919795	BetaGauge 330-30 as above with 1500 psi BetaPort-P external pressure module
1919796	BetaGauge 330-30 as above with 3000 psi BetaPort-P external pressure module
1919797	BetaGauge 330-30 as above, BetaPort-P external pressure module NOT INCLUDED
	All custody transfer calibration kits include • BPPA-100 pressure module adapter • LTP-100A 100Ω RTD probe
1919872	LDT-500 Liquid Dirt Trap for BetaGauge 330 (replacement) this is included in above calibrators and kits

Specifications

Ranges

Available Pressure

PSIG:	-12 to 30 PSI /-0.8 to 2 bar
	-12 to 150 PSI /-0.8 to 10 bar
	-12 to 300 PSI / -0.8 to 20 bar
PSIA:	0 to 30 PSIA /0 to 2 bar A
	0 to 150 PSIA /0 to 10 bar A
mA	0 to 24 mA, max, load 1000 Ohms
RTD	Pt100-385, -40 to 150°C

Engineering Units

psi, bar, mbar, kPa, MPa, kg/cm^2, cmH$_2$O@4°C, cmH$_2$O@20°C, mmH$_2$O@4°C, mmH$_2$O@20°C, mmHg@0°C, inH$_2$O@4°C, inH$_2$O@20°C, inH$_2$O@60°F, inHg@0°C

Instrument Power Supply	24 VDC at 24 mA

Accuracy

Pressure

±0.035% of full scale on internal sensor
module dependent for external sensors
Add 0.002% FS/°C outside of 15 to 35°C

mA	±0.015% of reading ± 2 counts (simulation and measurement)
Volts	±0.015% of reading ± 2 counts (measurement only)
Temperature	±0.1°C (0.2°F) (measurement only) (Pt100 RTD)

General

Integrated internal electrically operated pneumatic pump:
generates -12 PSI to 300 PSI pressure
(-0.8 to 20 Bar, -80 to 2000 kPa)

Environmental

Operating Temperature	-10 °C to +50 °C
Storage Temperature	-20 °C to +60 °C

Power Requirements

Battery	Eight (8) standard Alkaline AA batteries
Battery Life	100 pump cycles to 300 PSI minimum 1000 pump cycles to 30 PSI

Physical

Dimensions	8" high x 4" wide x 2-3/8" deep (20 cm x 10 cm x 6 cm)
Weight	2.5 pounds (1.2 kg)

Connections

Pressure:	1/8" female NPT - Stainless Steel
Electrical:	standard banana jacks
RTD:	4 pin LEMO style
External module:	6 pin LEMO style

Included Accessories - NIST traceable calibration certificate, batteries installed, test leads, test hose, fittings, user guide, carrying case.

The BetaGauge 321A/311A

Whichever you choose, the single sensor BetaGauge 311A, or the dual sensor BetaGauge 321A, you'll have everything you need for calibrating pressure anywhere. Gas custody transfer is the ideal application for the accuracy and capabilities of the BetaGauge 321A. Select from two standard configurations: 15 psi/1500 psi, or 30 psi/3000 psi, or create a custom configuration by selecting between any two ranges. The BetaGauge 311A can be configured by selecting from any range from 0.4, 1, 5, 7, 15, 30, 50, 100, 150, 300, 500, 1000, 1500, 3000, 5000, or 10000 psi. Both are supplied with soft case, AA batteries, manual, NIST-traceable certificate, and test leads. Both are available in kits including the Pressure Calibrator, Pt100 RTD Probe, AA batteries, manual, NIST-traceable certificate, test leads, and hard-sided carrying case. The inproved 'A' version provides enhanced features over the predecessor, including a Power-Tool-Tough case, custom engineering units, user-adjustable resolution, and enhanced stability.

BetaGauge 321A
Dual Sensor

BetaGauge 311A
Single Sensor

General Features

- **For intrinsically safe applications choose the 311A-Ex or 321A-Ex versions**
- Two isolated, stainless steel, pressure sensors with 0.025% F.S. accuracy (one on 311A)
- 27 available pressure ranges
- Temperature-compensation ensures accuracy in the field applications
- External pressure module connection supports all BetaPort-P pressure modules (27 ranges) for even more measurement capability (unavailable on Ex unit)
- Pt100 RTD input for temperature measurement, accurate to 0.1°C (0.2°F)
- Measure 4-20 mA input
- Internal 24 V Loop Power Supply can power a transmitter under test (unavailable on Ex unit)
- Measure up to 30 V DC (unavailable on Ex unit)
- Large graphic style LCD with backlight can be configured to display up to 3 inputs simultaneously (i.e. pressure 1, pressure 2, and RTD or any combination of inputs)
- Ideal for gas flow calibration (custody transfer) applications
- Pressure displayed in the user's choice of 17 engineering units plus custom
- Switch test on Pressure 1, Pressure 2, or external pressure module
- Operating mode layers support simple measurements to complex applications
- Up to five frequently used setups can be stored; last setup automatically recalled on power-up
- % Error and damping functions
- Small, rugged compact design operates on four (4) standard AA batteries

Specifications (15 °C to 35 °C, unless otherwise noted)

Ranges (see table at right)

RTD input range
(Pt100-385)   -40°C to 105°C (-40°F to 220°F)

Temperature Effect
No effect on accuracy on all functions from 15°C to 35°C Add ±0.002% F.S./°C for temps outside of 15°C to 35°C

Engineering Units
psi, bar, mbar, kPa, kg/cm^2, $cmH_2O@4°C$, $cmH_2O@20°C$, $mmH_2O@4°C$, $mmH_2O@20°C$, $inH_2O@4°C$, $inH_2O@20°C$, $inH_2O@60°F$, $mmHg@0°C$, $inHg@0°C$, MPa, $FT H_2O@60°C$ plus 2 custom at time of order

Accuracy

Pressure

0.4 psi	±0.1 % FS
1.0 psi	±0.05 % FS
15 to 3000 psi	±0.025 % FS
5,7, 5000, 10000 psi	±0.035 % FS
mA	±0.015% of reading ±0.002mA
Volts	±0.015% of reading ±0.002V
RTD input range (Pt100-385)	±.01°C

Temperature Effect
No effect on accuracy on all functions from 15°C to 35°C
Add ±0.002% F.S./°C for temps outside of 15°C to 35°C

General

Instrument Setup Recall 5; last used on power-up

Environmental

Operating Temperature	-10 °C to +50 °C
Storage Temperature	-20 °C to +60 °C

Power Requirements	6.0 VDC
Battery	Four (4) standard AA cells
Battery Life	>35 hours, typical usage

Physical

Dimensions	8.3" H x 3.9"W x 1.8"D
	(21.082 x 9.906 x 4.572 cm)
Weight	1 lbs, 4 oz. (0.567 kg)

Connectors/Ports Pressure
Two, 1/8" NPT
External BetaPort-P pressure module;
RTD

Available Ranges

Ranges:

Isolated Gauge (PSIG):
0 to 1000 (0 to 70 Bar), 0 to 1500 (0 to 100 Bar),
0 to 3000 (0 to 200 Bar), 0 to 5000 (0 to 340 Bar),
0 to 10000 (0 to 700 Bar)

Non Isolated Compound (PSIG):
-0.4 to 0.4 (-25 to 25 mBar), -1 to 1 (-70 to 70 mBar),
-5 to 5 (-350 to 350 mBar), -7.2 to 7.2 (-500 to 500 mBar),
-15 to 15 (-1 to 1 Bar), -15 to 30 (-1 to 2 Bar)

Isolated Compound (PSIG):
-12 to 50 (-0.8 to 3.5 Bar), -12 to 100 (-0.8 to 7 Bar),
-12 to 150 (-0.8 to 10 Bar), -12 to 300 (-0.8 to 20 Bar),
-12 to 500 (-0.8 to 35 Bar)

Isolated Absolute (PSIA):
0 to 15 (0 to 1 Bar), 0 to 30 (0 to 2 Bar), 0 to 100 (0 to 7 Bar),
0 to 150 (0 to 10 Bar), 0 to 300 (0 to 20 Bar)

Non Isolated Differential (PSID):
-0.4 to 0.4 (-25 to 25 mBar), -1 to 1 (-70 to 70 mBar),
-5 to 5 (-350 to 350 mBar), -12 to 30 (-0.8 to 2 Bar),
-12 to 50 (-0.8 to 3.5 Bar), -12 to 100 (-0.8 to 7 Bar)

BetaGauge 311A-321A Ordering Information

Part Number	Description
1919299	BetaGauge 311A, specify range from table above except for 10,000 psi/700 bar
1919689	BetaGauge 311A with high strength stainless steel manifold for 10,000 psi/700 bar range or specify range from table above
1919275	BetaGauge 321A-15/1500 with 15 psi/1 bar & 1500 psi/100 bar internal ranges
1919243	BetaGauge 321A-30/3000 with 30 psi/2 bar & 3000 psi/200 bar internal ranges
1919276	BetaGauge 321A with custom ranges from table above except for 10,000 psi/700 bar
1919550	BetaGauge 321A with high strength stainless steel manifold for 10,000 psi/700 bar range, specify ranges from table above
	All units above include • Batteries • Test leads • NIST traceable calibration certificate • User guide • Soft sided carrying case
	Custody Transfer Calibration Kits
1919307	BetaGauge 311A, specify range from table above
1919280	BetaGauge 321A-15/1500 calibrator as above
1919281	BetaGauge 321A-30/3000 calibrator as above
1919282	BetaGauge 321A with custom ranges from table above
	All custody transfer calibration kits include • Hard sided carrying case • LTP-100A 100Ω RTD probe

The BetaGauge 311A-EX/321A-EX
Intrinsically Safe Pressure Calibrator

Whichever you choose, the single sensor BetaGauge 311A-EX, or the dual sensor BetaGauge 321A-EX, you'll have everything you need for calibrating pressure anywhere. Gas custody transfer is the ideal application for the accuracy and capabilities of the BetaGauge 321A-EX. Create a custom configuration by selecting from any two ranges. The BetaGauge 311A-EX can be configured by selecting from any range. Both are supplied with soft case, AA batteries, manual, NIST-traceable certificate, and test leads. Both are available in kits including the Pressure Calibrator, Pt100 RTD Probe, AA batteries, manual, NIST-traceable certificate, test leads, and hard-sided carrying case.

Approval Details

Ex ia IIB T3 Gb (Ta=–10... +45°C)
KEMA 10 ATEX 0168X 0344
Ex ia IIB T3 Gb (Ta=–10... +45°C)
II 2 G IECEx CSA 10.0013X

General Features

- Single or dual pressure sensors with up to ±0.025% F.S. accuracy
- 27 available pressure ranges
- Temperature-compensation ensures accuracy in the field applications
- Pt100 RTD input for temperature measurement, accurate to 0.1°C (0.2°F)
- Measure 4-20 mA input
- ClearBrite™ graphic style LCD with backlight can be configured to display up to 3 inputs simultaneously (i.e. pressure 1, pressure 2, and RTD or any combination of inputs)
- Ideal for gas flow calibration (custody transfer) applications
- Pressure displayed in the user's choice of 19 engineering units
- Switch test on Pressure 1 or Pressure 2
- Operating mode layers support simple measurements to complex applications
- Up to five frequently used setups can be stored; last setup automatically recalled on power-up
- % Error and damping functions
- Small, rugged compact design operates on four (4) Alkaline AA batteries

BetaGauge 321A-EX
Dual Sensor

Specifications (15 °C to 35 °C, unless otherwise noted)

Ranges
Available Pressure

Isolated Gauge (PSIG):

0 to 1000 (0 to 70 Bar), 0 to 1500 (0 to 100 Bar),
0 to 3000 (0 to 200 Bar), 0 to 5000 (0 to 340 Bar),
0 to 10000 (0 to 700 Bar)

Non Isolated Compound (PSIG):

-0.4 to 0.4 (-20 to 20 mBar), -1 to 1 (-70 to 70 mBar),
-5 to 5 (-350 to 350 mBar), -7.2 to 7.2 (-500 to 500 mBar),
-15 to 15 (-1 to 1 Bar), -15 to 30 (-1 to 2 Bar)

Isolated Compound (PSIG):

-12 to 100 (-0.8 to 7 Bar),
-12 to 300 (-0.8 to 20 Bar),
-12 to 500 (-0.8 to 35 Bar)

Isolated Absolute (PSIA):

0 to 15 (0 to 1 Bar), 0 to 30 (0 to 2 Bar), 0 to 100 (0 to 7 Bar),
0 to 300 (0 to 20 Bar)

Non Isolated Differential (PSID):

-0.4 to 0.4 (-20 to 20 mBar), -1 to 1 (-70 to 70 mBar),
-5 to 5 (-350 to 350 mBar), -12 to 30 (-0.8 to 2 Bar),
-12 to 50 (-0.8 to 3.5 Bar), -12 to 100 (-0.8 to 7 Bar)

mA	0 to 24.000 mA
RTD	-40°C to 105°C (-40°F to 220°F)

Engineering Units

psi, bar, mbar, kPa, kgcm^2, cmH$_2$O@4°C, cmH$_2$O@20°C,
mmH$_2$O@4°C, mmH$_2$O@20°C, inH$_2$O@4°C, inH$_2$O@20°C,
inH$_2$O@60°F, mmHg@0°C, inHg@0°C, ftH$_2$O@4°C,
ftH$_2$O@20°C, ftH$_2$O@60°F

Plus up to 2 user specified custom units

Accuracy
Pressure

0.4 psi	±0.1 % FS
1.0 psi	±0.05 % FS
15 to 3000 psi	±0.025 % FS
5, 7.2, 5000, 10000 psi	±0.035 % FS
mA	±0.015% of rdg ±0.002mA
RTD input range (Pt100-385)	±.01°C

Temperature Effect

No effect on accuracy on all functions from 15°C to 35°C

Add ±0.002% F.S./°C for temps outside of 15°C to 35°C

General
Instrument Setup Recall 5; last used on power-up

Environmental	
Operating Temperature	-10 °C to +50 °C
Storage Temperature	-20 °C to +60 °C
Power Requirements	6.0 VDC
Battery	Four (4) standard AA cells
Battery Life	>35 hours, typical usage
Physical	
Dimensions	8.3" H x 3.9"W x 1.8"D
	(21.082 x 9.906 x 4.572 cm)
Weight	1 lbs, 4 oz. (0.567 kg)

Connectors/Ports Pressure

Two, 1/8" NPT

RTD

BetaGauge 311A-EX
Single Sensor

BetaGauge 311A-EX / 321A-EX Ordering Information	
Part Number	**Description and Range**
1919915	BetaGauge 311A-EX-[range]-[style]
1919916	BetaGauge 311A-EX-SS-[range]-[style] (high strength stainless steel manifold)
1919854	BetaGauge 321A-EX-[range1]-[style]-[range2]-[style]
1919914	BetaGauge 321A-EX-SS-[range1]-[style]-[range2]-[style] (high strength stainless steel manifold)
1919913	BetaGauge 311A-EX-KIT-[range]-[style] (custody transfer calibration kit w/RTD probe)
1919912	BetaGauge 321A-EX-Kit-[range1]-[style]-[range2]-[style] (custody transfer calibration kit w/RTD probe)
Ranges	**See specifications at left**
Styles	C=compound, G=gauge, A=absolute, D=differential*

*Differential only available on BetaGauge 311A-EX

DPC-300A Dual System Pneumatic Calibrator

Portable Pressure Calibration Powerhouse

The Martel BETA DPC-300A isn't just a replacement for the old "box" calibrator. With full digital precision and accuracy, a dual pressure system and a built-in loop calibrator function, it's a pressure calibration powerhouse in a portable format.

A dual pressure system means you can use regulated plant air or internally generated pressure sources for calibration. The internal pump goes up to 300 psi with pushbutton ease. Exact values are set using the fine vernier control knob. Plant air, up to 100 psi is controlled with a precision regulator for low inches of water on up.

Speaking of inches of water column, the user can elect to display the pressure signal in any of 13 engineering units.

As they say on TV, "but wait, there's more": a built-in loop calibrator with 24 VDC instrument loop power supply; high capacity rechargeable NiMH batteries for 50 hours of use or 125 cycles of pumping to 300 psi, Martel's trademark 3 key function menus, ClearBrite™ LCD display and multimode operation to name a few.

This high performance calibrator comes in a high performance housing. It's a rugged IP67 rated blown resin case that can take a pounding when used in the field. IP67 means waterproof including immersion when the case is closed.

General Features

- Dual pressure systems
  - Regulated plant air to 100 psi / 7 bar
  - Integral electric pump to 300 psi / 20 bar
- Pressure accuracy up to ±0.025% reading
- Built-in loop calibrator with 24 V loop power
- External pressure module interface
- 24 VDC instrument power supply
- User's selection of 13 engineering units
- Heavy duty IP67 case (cover closed)
- Long life rechargeable NiMH battery power

For more information:
- Call us toll free at 800-821-0023 or 603-434-1433
- Fax us at 603-434-1653
- Or go to website, www. Martelcalibrators.com and click on DPC-300A.

Specifications

Instrument Setup Recall	5 setups; last used setup displays on power-up
Environmental	
Operating Temperature	-10 °C to +50 °C
Storage Temperature	-20 °C to +60 °C
Battery Type	9 cell NiMH rechargeable; 3700 mAh @ 10.8V
Battery Life	Approx. 50 hours (only measurement or
(fully-charged)	with external pressure supply)
	125 pump cycles to 20 bar
	300 pump cycles to 10 bar
	1,000 pump cycles to 2 bar
Physical	
Dimensions	15.25" x 12" x 7" (387.4 x 304.8 x 177.8 mm)
Weight	15.5 lbs. (approx. 7 kg)
EMI/RFI Conformance	EN50082-1: 1992 and EN55022: 1994 Class B
Safety	EN/IEC 61010-1:2010 3rd Edition
	(Low Voltage Directive)
Connectors/Ports	1/8" NPT; BetaPort-P pressure module jack;
	power jack
Included Accessories	Reference manual, NIST-traceable calibration
	certificate, test leads and hose kit.
Ranges	
Pressure	-12 to 300.00 psi / -0.8 to 20 bar / -80 to 2000 kPa
mA	0 to 24.000 mA
Volts	0 to 30.000 VDC
Engineering Units	psi, bar, mbar, kPa, MPa, kgcm^2,
	mmH$_2$O @ 4°C, mmH$_2$O @ 20°C,
	cmH$_2$O @ 4°C, cmH$_2$O @ 20°C,
	inH$_2$O @ 4°C, inH$_2$O @ 20°C, inH$_2$O @ 60°F,
	mmHg @ 0°C,
	inHg @ 0°C
Accuracy	
Pressure	6 months: ±0.025% of reading ±0.01% of full scale
	1 year: ±0.035% of reading ±0.01% of full scale
mA	±0.015% of reading ±0.002mA
Volts	±0.015% of reading ±0.002V
Temperature Effect (all functions)	
	No effect on accuracy on all functions from 15°C to 35°C
	Add ±0.002% F.S./°C for temps outside of 15°C to 35°C

DPC-300A

DPC-300A Dual System Pneumatic Calibrator Ordering Information	
Part Number	**Description**
1920022	DPC-300A Calibrator, including Reference Manual, NIST traceable calibration certificate, test leads, battery pack, universal charger/AC adapter and hose kit
1919872	LDT-500 Liquid Dirt Trap (optional), protects internal pump from contamination with process fluids
TBD	Kit, valve seal replacement
1010064	Kit, vernier repair
80438	AC Adapter/Charger, replacement
5454067	Filter, replacement

The BetaGauge PI PRO

Digital Test Gauge takes the concept of an analog Test Gauge, and brings it to a new level. The NEW BetaGauge P. I. PRO combines the accuracy of digital technology with the simplicity of an analog gauge and achieves performance, ease-of- use, and a feature set unmatched in the pressure measurement world.

Setup of the BetaGauge P. I. PRO is fast and straightforward, through a menu-driven display, that is simple enough to allow the gauge to be used anywhere in the world.

The BetaGauge P. I. PRO first and foremost, provides 0.05% of full scale accuracy of pressure in any one of eighteen (18) ranges. Readings may be displayed in any one of 23 standard engineering units, or in 1 custom unit you define, to eliminate tedious conversion calculations.

The 5 digit, 0.65" high digital display and companion percent-of-range bar graph provide an easy to read display, even from a distance. The sample rate can be user adjusted to match the measurement required. A power saving mode maximizes battery life to 2,000 hours. Other features include MIN/MAX function, Auto Power Off and backlight control.

Password-protected field calibration of the BetaGauge P. I. PRO may be initiated through the keypad. An RS232 port allows pressure reading data to be extracted directly from the gauge for off-line analysis. (Requires Martel RS232 cable (P/N C232SJ).) In addition to a ZERO function that compensates for sensor drift, large residual system pressures can be nulled using the TARE adjustment. This adjustment, when combined with the ability to create custom engineering units for display, allows the BetaGauge P.I. PRO to be used in a variety of liquid level and volume measurements, easily reading units of interest, such as gallons in a tank, directly.

**BetaGauge PI PRO
(Shown with
optional pump)**

Damping can be set to integrate readings to accommodate pulsating sources, such as plant air. An optional external 24 VDC power input is available for applications where the BetaGauge P. I. PRO will be permanently incorporated into a process line. A protective rubber boot is standard to help protect the BetaGauge P. I. PRO from damage when dropped. The BetaGauge P. I. PRO is available in a self-contained calibration kit, including a hand pressure pump, and associated fittings.

General Features

- Accuracy of ±0.05% of F. S.
- 18 standard pressure ranges available
- Data logging
- Displays in 23 standard or 1 custom engineering unit
- Displays ambient temperature in °C or °F
- Large, back-lit, 5-1/2 digit display with 0.65" high digits and 20 segment bar graph
- Adjustable TARE zeros large system offsets
- User-configurable sample rate maximizes measurement performance and battery life
- User-configurable damping smooths readings from pulsating/plant air sources
- Auto Shut-off for extended battery life
- Low battery indicator
- CSA Intrinsically Safe, Class 1, Div. 2 Groups A,B,C, & D; ATEX approved; CE approved
- Available with optional 24 V external power input
- Rubber boot standard on all stand-alone bottom mount gauges

Specifications

Accuracy
± 0.05 % FS positive pressure
± 0.1 % FS for 1.0 psi and 10" w.c.

Temperature Compensation
15 °C to 35 °C (59 °F to 95 °F) to rated accuracy
NOTE: For temperatures from -10 °C to 15 °C and 35 °C to 55 °C, add .003% FS/°C

Standard Engineering Units
PSI, Bar, Kg/cm^2, inH$_2$O (4 °C, 20 °C or 60 °F),
ft H$_2$O (4 °C, 20 °C or 60 °F), cmH$_2$O (4 °C and 20 °C),
mH$_2$O (4 °C and 20 °C), Kpa, mBAR, inHg, mmHg, TORR

Media Compatibility
liquids and gases compatible with 316 stainless steel;
except for ranges noted as non-isolated

Environmental

Operating Temperature	-10 °C to +55 °C
Storage	-20 °C to +70 °C (-4 °F to +158 °F)

Mechanical

Dimensions	4.375" x 5.0" x 1.50"
Input Port	1/4" male NPT

Display

5 Digits,	0.65" (16.53 mm) height
Bar Graph	0 to 100% in 20 segments

Power

Battery	three (3), size AA alkaline batteries
Battery Life	1,500 hours without backlight; 2,000 hours at slow sample rate; battery life can be displayed on bar graph to indicate the amount of time left
Low Battery Indicator	displayed icon near the end of battery life

Includes: NIST traceable calibration certificate, batteries, and user guide

The BetaGauge PI PRO

BetaGauge PI-PRO Ordering Information

Range	Sensor Type	Standard Gauge	Rear Mount Style	24 VDC Powered	Rear Mount + 24 VDC Powered	Kit
-10…+10" WC (0.4 psi/ 25 mbar)	Non-isolated	1919996	Inquire	Inquire	Inquire	NA
-30…+30" WC (1 psi/70 mbar)	Non-isolated	1919402	1919458	1919459	1919460	NA
0…15 psi/ 0…1 bar	Isolated	1919157	1919164	1919203	1919211	1919219*
0…30 psi/ 2 bar	Isolated	1919158	1919165	1919204	1919212	1919220*
-15…15 psi/ -1…1 bar	Non-isolated	1919445	1919446	1919447	1919450	1919452*
-15…30 psi/ -1…2 bar	Non-isolated	1919381	1919382	1919448	1919442	1919400*
-12…100 psi/ -0.8…7 bar	Isolated	1919159	1919196	1919205	1919213	1919221*
-12…300 psi/ -0.8…20 bar	Isolated	1919303	1919355	1919449	1919398	1919453*
-12…500 psi/ -0.8…35 bar	Isolated	1919160	1919197	1919206	1919214	1919222*
0…1000 psi/ 0…70 bar	Isolated	1919178	1919198	1919207	1919215	1919223**
0…2000 psi/ 0…140 bar	Isolated	1919304	1919305	1919456	1919451	1919454**
0…3000 psi/ 0…200 bar	Isolated	1919161	1919199	1919208	1919216	1919224**
0…5000 psi/ 0…350 bar	Isolated	1919162	1919200	1919209	1919217	1919434**
0…10000 psi/ 0…700 bar	Isolated	1919163	1919201	1919210	1919218	1919435**
15 psia/ 1 bar(a)	Isolated	1919684	Inquire	Inquire	1919777	Inquire
30 psia/ 2 bar(a)	Isolated	1919685	Inquire	Inquire	Inquire	Inquire
100 psia/ 7 bar(a)	Isolated	1919686	Inquire	Inquire	Inquire	Inquire
300 psia/ 20 bar(a)	Isolated	1919687	Inquire	Inquire	Inquire	Inquire

BetaGauge PI-PRO Pneumatic Kit

BetaGauge PI-PRO Hydraulic Kit

BetaGauge PIR-PRO Reference Class Digital Test Gauge

When accuracy really counts, the BetaGauge PIR-PRO Reference Class digital test gauge is the one to count on. With best in the business accuracy of ±0.04% of reading ±0.01% of full scale, nothing beats it for the money.

It's the same rugged, easy to use package as the standard BetaGauge PI-PRO with fast and intuitive keypad controls and a big bright display.

Available in 8 ranges from 30 psi full scale to 10,000 psi full scale, the BetaGauge PIR-PRO can display readings in the user's choice of any of 18 standard engineering units plus 1 custom user-defined unit.

The 5-digit, 0.65" high LCD display and companion percent-of-range bar graph provide an easy to read display, even from a distance. The sample rate can be user adjusted to match the measurement required. A power saving mode maximizes battery life to 2,000 hours. Other features include MIN/MAX function, Auto Power Off and backlight control.

Using optional BetaLOG-PI software, a PIR-PRO becomes a high performance pressure data logger capable of recording over 9500 data points over periods ranging from seconds to days long depending upon configuration. Pressure data is uploaded to the user's PC in .CSV or Excel formats.

A protective rubber boot is standard to help protect the BetaGauge PIR- PRO from damage when dropped. It's also available in a self-contained calibration kit, including a hand pressure pump, and associated fittings.

Specifications (0 °C to 50 °C, unless otherwise noted)

Accuracy
±0.04% of rdg ± 0.01% of FS

Temperature Compensation
0 °C to +50 °C (32 °F to +122 °F) to rated accuracy

Standard Engineering Units
PSI, Bar, Kg/cm^2, inH$_2$O (4 °C, 20 °C or 60 °F),
ft H$_2$O (4 °C, 20 °C or 60 °F), cmH$_2$O (4 °C and 20 °C),
mH$_2$O (4 °C and 20 °C), Kpa, mBAR, inHg, mmHg, TORR

Media Compatibility
liquids and gases compatible with 316 stainless steel;
except for ranges noted as non-isolated

Environmental
Operating Temperature   -10 °C to +55 °C
Storage   -20 °C to +70 °C (-4 °F to +158 °F)

Mechanical
Dimensions   4.375" x 5.0" x 1.50"
Input Port   1/4" male NPT

Display
5 Digits,   0.65" (16.53 mm) height
Bar Graph   0 to 100% in 20 segments

Power
Battery   three (3), size AA alkaline batteries
Battery Life   1,500 hours without backlight;
                     2,000 hours at slow sample rate;
                     battery life can be displayed on bar
                     graph to indicate the amount of
                     time left
Low Battery Indicator   displayed icon near the end of
                         battery life

General Features

- Temperature compensated accuracy over 0 to 50 °C
- 8 standard pressure ranges available
- Displays in 23 standard or 1 custom engineering unit
- Displays ambient temperature in °C or °F
- Large, back-lit, 5 digit display with 0.65" high digits and 20 segment bar graph
- Adjustable TARE zeros large system offsets
- User-configurable sample rate maximizes measurement performance and battery life
- User-configurable damping smooths readings
- Auto Shut-off for extended battery life
- Low battery indicator
- CSA Intrinsically Safe, Class 1, Div. 2 Groups A,B,C, & D;
- ATEX approved; CE approved
- Available with optional 24 V external power input
- Rubber boot standard on all stand-alone bottom mount gauges

BetaGauge PIR-PRO Reference Class Ordering Information

Range	Sensor Type	Standard Gauge	Rear Mount Style	24 VDC Powered	Rear Mount + 24 VDC Powered	Kit
-15…30 psi/ -1…2 bar	Non-isolated	1919597	1919609	1919603	1919615	1919852*
0…30 psi/ 2 bar	Isolated	1919598	1919610	1919604	1919616	Inquire*
-12…100psi/ -0.8…7 bar	Isolated	1919599	1919611	1919605	1919617	1919853*
-12…500 psi/ -0.8…35 bar	Isolated	1919600	1919612	1919606	1919618	1919851*
0…1000 psi/ 0…70 bar	Isolated	1919601	1919613	1919607	1919619	Inquire**
0…3000 psi/ 0…200 bar	Isolated	1919602	1919614	1919608	1919620	1919690**
0…5000 psi/ 0…350 bar	Isolated	1919692	1919696	1919694	1919698	1919805**
0…10000 psi/ 0…700 bar	Isolated	1919693	1919697	1919695	1919699	1919803**

NA=Not Available
All gauges include NIST traceable calibration certificate, batteries and user guide.
*Includes MECP500 pneumatic test pump with gauge mounted, test hose (3'/1m), 1/8" NPT connectors & hard sided carrying case.
**Includes MECP10K hydraulic test pump with gauge mounted, high pressure test hose, 1/4" NPT connectors & hard sided carrying case.

BetaLOG™

BetaLOG is the high performance answer for pressure data logging applications. Whether you need to log data on one BetaGauge PI-PRO or 100, this easy to use, low cost application handles your entire requirement. And, BetaLOG also works with the ultra-accurate, BetaGauge PIR-PRO Reference Class gauge.

BetaLOG configures the gauge to operate in demand ad-hoc mode (field configuration or download mode (computer configuration) for complete flexibility in configuring your data logging application.

Using the download operational mode allows a wide range of configuration settings, including:
- Multiple interval selection options from 1 second to 1 hour.
- Data logging runs can range from only a few seconds to several weeks
- Log ambient temperature along with pressure for leak testing applications.
- Four types of data capture mode allows you to log either all data or only the points you're interested in.
  - Continuous (log all data at predefined intervals)
  - Data high (log data only when it rises above a preset value)
  - Data low (log data only when it falls below a preset value)
  - Delta trip (for detecting noise or transients in the pressure signal)
- Number of data points to record (up to the maximum of 9520 points)
- Type of data
  - Interval end
  - Average
  - Minimum
  - Maximum
  - Median
  - Average/Minimum/Maximum

But, it's not only the BetaLOG software that's smart. The BetaGauge PI-PRO is smart, too. With its high speed 10 readings per second measurement ability, you'll get the kind of accuracy you need for your application. It's ideal for applications like hydrostatic testing of pressure vessels and monitoring of well head pressures.

When set to Demand mode data logging, you can easily set up and initiate data logging in the field using the BetaGauge PI-PRO keypad with a few easy key presses. Did we mention in the field? That's where BetaGauge PI-PRO shines with its rugged stainless steel rubber booted housing, durable Lexan® faceplate, IP 65 rating and extremely long battery life. It is also CSA and ATEX rated for use in hazardous areas.[1]

The BetaGauge PI-PRO supports multiple data sets and they can be mixed between Demand mode and Download mode, no problem!

Once the data is logged in the gauge non-volatile memory, a quick serial connection allows BetaLOG to retrieve the data and store it on your computer in a variety of formats:
• Plain ASCII text (.TXT)
• Comma delimited text (.CSV)
• Microsoft™ Excel™ Spreadsheet (requires Excel 2002 or later on the host PC).
• Microsoft Excel Spreadsheet with template formatting (sample templates come with the BetaLOG application and you can create your own to meet your specific requirements).

The data you get is reliable, accurate, easy to acquire and manage for a tremendous variety of applications.
• Hydrostatic pressure testing
• Leak detection
• Transient pressure spike detection
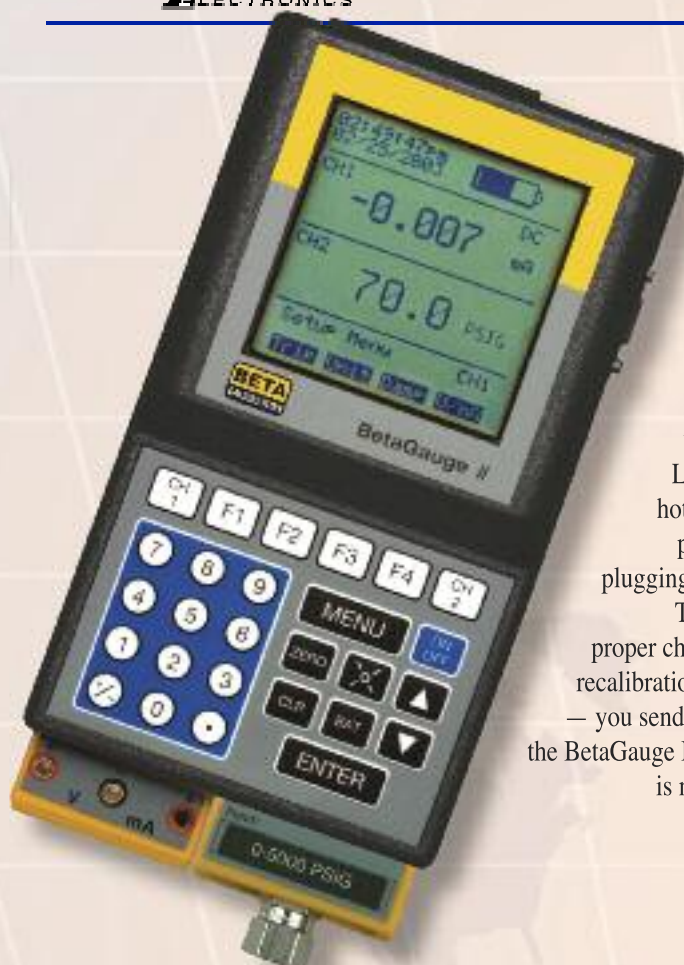• Well head pressure monitoring
• And many others…

BetaLOG software is not only easy to use; it runs quickly on almost any modern Windows™ based PC. The basic requirements are:
• Pentium CPU, 1.0 GHz
• 512 MB RAM
• 5 MB disk storage plus additional storage for logged data
• Windows XP Professional, Vista Business or Ultimate, Windows 7
• Optional Microsoft Excel spreadsheet software (for data analysis in spread sheet format)
• BetaGauge PI or PIR with firmware revision 3.00 or higher

BetaLOG Ordering Information	
Part Number	**Description**
1919826	BetaLOG-PI software on CD, USB communications cable, User Manual
0200039	Replacement Media (CD)
1919849	BetaLOG-PI KIT with software as above and BetaGauge PI-PRO (specify range)
1919850	BetaLOG-PI KIT with software as above and BetaGauge PIR-PRO (specify range)

The BetaGauge II

The BetaGauge II is a two-channel pressure calibrator, with interchangeable modules for measuring a variety of pressure ranges and DC electrical signals. The BetaGauge II becomes a documenting calibrator when used with our versatile, menu-driven, PC-based ProCAL Software.

Used together, they can create a centralized database, with a history for every pressure instrument and pressure I/O loop in your plant, with minimal guesswork and data entry. The BetaGauge II's RS232 port also permits use with key software programs from manufacturers like Cornerstone, Honeywell Loveland, Emerson AMS, and others. The BetaGauge II uses two independent, hot swappable, field changeable pressure modules, available in a wide variety of pressure ranges to redefine calibrator versatility. Changing ranges is as easy as plugging in new input modules, which can be done even while the unit is powered up. The BetaGauge II automatically recognizes the signals and assigns them to the proper channel. This plugin design simplifies maintenance, too. The base unit needs no recalibration; only the input modules do. That means you never have to be out of service — you send only the out-of-calibration modules back to the shop, while continuing to use the BetaGauge II in the field. For optimum mechanical strength, external pressure connection is made by a 1/8" FNPT 316SS connector welded to a stainless steel metal plate.

Features

- Available pressure ranges - any two companion modules
- DC electrical measurements; 0.01% accuracy
- Pressure measurements; ±0.025% FS (typical)
- 128 by 128 pixel, 63 by 63 mm LCD display with on-demand backlighting
- Pressure displayed in 15 standard engineering units plus custom
- Field Calibrator Interface Standard (FCINTF) compatible
- ESD protection on all pins; EMI shielding
- Intrinsically safe; Class 1, Division 2, Groups A, B, C, and D
- CE approved; EC92 compliant
- % Error

BetaGauge II Ordering Information

Part Number	Description
910325-110	BetaGauge II with 120 VAC primary power & intrinsically safe battery pack
910325-112	BetaGauge II with 220 VAC primary power & intrinsically safe battery pack
910325-210	BetaGauge II with 120 VAC primary power & quick charge battery pack
910325-212	BetaGauge II with 220 VAC primary power & quick charge battery pack

All units above include
- DC input module with NIST traceable calibration certificate
- Battery pack with charger
- Test leads
- PC interface cable (9-pin RS-232)
- User guide
- Conformance certificate
- Soft sided carrying case

DC Input Module

Voltage:	Autoranging:
> 1M ohms input impedance	0 to ±249.99 mVdc 0 to ±2.4999 Vdc 0 to ±24.999 Vdc

Current:	Autoranging:
5 ohms input impedance	0 to ±24.999 mAdc 0 to ±149.99 mAdc

BetaPort–P Digital Pressure Modules
AVAILABLE RANGES

PART NUMBER	RANGE	ACCURACY*	VACUUM ACCURACY	OVER PRESSURE
Isolated Gauge (PSIG)				
910331-015	0…15 (0…1 bar)	±0.025%	NA	300%
910331-030	0…30 (0…2 bar)	±0.025%	NA	300%
910326-500	0…500 (0…35 bar)	±0.025%	NA	200%
910326-301	0…1000 (0…70 bar)	±0.025%	NA	200%
910326-315	0…1500 (0…100 bar)	±0.035%	NA	200%
910326-303	0…3000 (0…200 bar)	±0.05%	NA	200%
910326-305	0…5000 (0…350 bar)	±0.05%	NA	200%
910331-10K	0…10000 (0…700 bar)	±0.1%	NA	120%
Isolated Absolute (PSIA)				
910332-015	0…15 (0…1 bar A)	±0.04%	NA	300%
910332-030	0…30 (0…2 bar A)	±0.025%	NA	300%
910332-050	0…50 (0…3.5 bar A)	±0.03%	NA	300%
910332-100	0…100 (0…7 bar A)	±0.025%	NA	300%
910332-300	0…300 (0…20 bar A)	±0.025%	NA	200%
Non-isolated Compound (PSIG)				
910331-003	-0.4…0.4 (10" WC) (25 mbar)	±0.1%	±0.15%	400%
910331-001	-1…1 (-70…70 mbar)	±0.05%	±0.1%	400%
910333-005	-5…5 (-350…350 mbar)	±0.075%	±0.1%	400%
910333-007	-7…7 (200"WC) (500 mbar)	±0.07%	±0.1%	400%
910333-010	-10…10 (-700…700 mbar)	±0.03%	±0.05%	300%
910333-015	-15…15 (-1…1 bar)	±0.04%	±0.04%	300%
910333-030	-15…30 (-1…2 bar)	±0.025%	±0.025%	300%
Isolated Compound (PSIG)				
910331-050	-12…50 (-0.8…3.5 bar)	±0.03%	±0.03%	200%
910331-100	-12…100 (-0.8…7 bar)	±0.025%	±0.025%	200%
910331-150	-12…150 (-0.8…10 bar)	±0.03%	±0.03%	200%
910331-300	-12…300 (-0.8…20 bar)	±0.025%	±0.025%	150%
Non-isolated Differential (PSID)**				
910329-005	0…5 (0…350 bar)	±0.075%	NA	400%
910329-303	0…30 (0…2 bar)	±0.025%	NA	300%
910329-050	0…50 (0…3.5 bar)	±0.03%	NA	300%

* % of full scale between 15 and 35°C
** Maximum static pressure 200 psi / 15 bar

BetaPort-P Digital Pressure Modules

Martel Electronics offers 27 standard pressure modules, covering gauge, vacuum, absolute, compound, and differential measurements. All modules are directly compatible with the BetaGauge II. With the Model BPPA-100 Pressure Module Adapter, all modules (with the exception of the DC measurement model) are fully compatible with the Martel DMC-1410, MC-1210 and MC-1010 Multi-Function Calibrators, the BetaGauge 330, 321A, 311A and 301 Pressure Calibrators, the Martel Electronics 3001 Laboratory/Bench Standards.

Pressure ranges may be displayed in any of 15 user selectable units. Water density correction factors of 4 °C, 20 °C, or 60 °F can be selected for either water column unit. The choice of pressure unit may be restricted by limitations on resolution of the instrument display of the particular calibrator the module is used with. For optimum mechanical strength, external pressure connection is made by a 1/8" FNPT 316SS connector welded to a stainless steel metal plate.
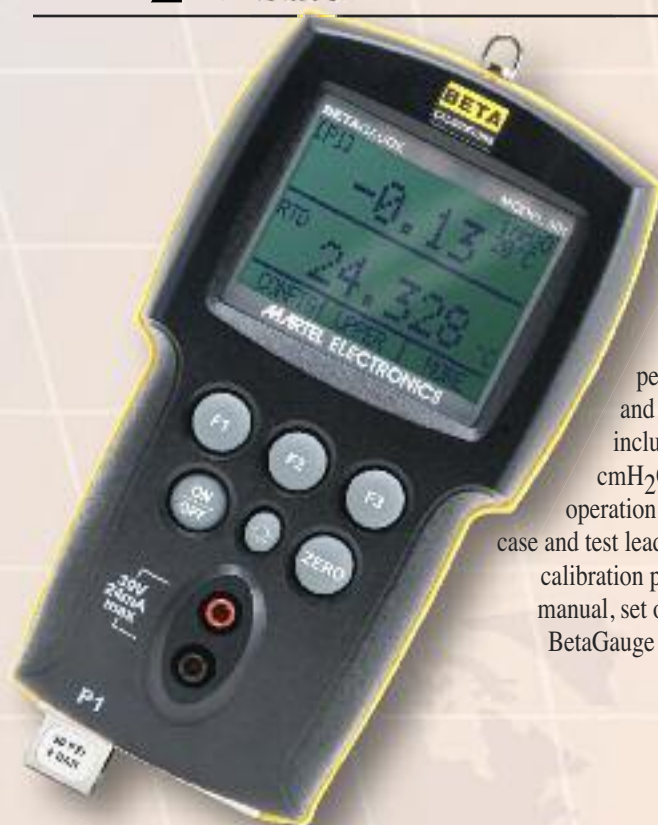
General Features
- 27 standard ranges
- Gauge, vacuum, absolute, compound, and differential measurements
- Accuracy specified over 15 °C to 35 °C range
- Isolated and non-isolated measurements, range dependent

Model BPPA-100 Pressure Module Adapter

BetaGauge Pressure Modules

The BetaGauge 301

The 301 is a single sensor pressure calibrator offering great performance at ±0.05% accuracy. It combines pressure with milliAmp and Voltage measurement capabilities, as well as a built-in loop power supply to power transmitters under test. With an optional BPPA-100 adapter, the 301 can even use industry standard BetaPort–P high performance pressure modules. A large backlit display can be configured to show one, two or three variables. Another advanced feature not normally seen in this price range is the ability to easily perform pressure switch tests. The calibrator automatically captures and displays set and reset values. Pressure readings can be displayed in a number of engineering units including PSI, inches of water (with selectable temperature compensation), Bar, mBar, cmH_2O, kPa and others including a User Defined option. Other features include remote operation via the RS-232 serial port; power from 4 AA Alkaline batteries, standard carrying case and test leads. A range of pressure pumps and pump kits are also available for a full pressure calibration package. The BetaGauge 301 is supplied with carrying case, test leads, instruction manual, set of four AA alkaline batteries, and a N.I.S.T. calibration certificate. Kits include the BetaGauge 301 Pressure Calibrator, carrying case, pneumatic pump, connections and fittings.

General Feature

- Full scale accuracy on all pressure ranges of ±0.05% FS
- Temperature compensation ensures accuracy in the field with no temperature effect over 18 °C to 23 °C
- Standard available pressure ranges — 1, 5, 30, 100, or 300 psi
- 4-20 mA measurement input
- DC Voltage measurement input range 0 to 30 V
- Internal 24 V Loop Power Supply
- Displays in 16 standard engineering units plus one user-defined
- Large graphic style LCD with backlight can be configured to display up to 3 inputs simultaneously
- External pressure module connection supports all BetaPort-P pressure modules
- Switch test on Pressure (internal or external)
- Up to five frequently used setups can be stored; last setup automatically recalled on power-up
- % Error and damping functions

Specifications (18 °C to 28 °C, unless otherwise noted)

Input Ranges
1 psi, 5 psi, 30 psi, 100 psi, 300 psi

Accuracy

All pressure ranges	±0.05 % FS
4-20 mA measurement	±0.015 % of rdg; ±0.002 mA
0-30 VDC measurement	±0.015% of rdg; ±0.002 V

Temperature Compensation
18 °C to 23 °C (64 °F to +73 °F) to rated accuracy

Standard Engineering Units
psi, bar, mbar, kPa, $kgcm^2$, $mmH_2O@4°C$, $mmH_2O@20°C$, $cmH_2O@4°C$, $cmH_2O@20°C$, $inH_2O@4°C$, $inH_2O@20°C$, $inH_2O@60°F$, $mmHg@0°C$, $inHg@0°C$, $ftH_2O@4°C$, $ftH_2O\ 0@20°C$ plus custom

Media Compatibility
Clean Dry Air or Gas only

Environmental

Operating Temperature	-10 °C to +55 °C
Storage	-20 °C to +60 °C (-4 °F to +140 °F)

Mechanical

Dimensions	21 cm H x 10 cm W x 4.6 cm D (8.3" H x 3.9" W x 1.8" D)
Weight	1 lb., 4 oz. (0.57 kg)

Input Ports
Pressure 1/8" FNPT, BetaPort-P pressure module, std. banana jacks for mA and V.

Display
Large, backlit, configurable display for 1, 2 or 3 variables

Power

Battery	four (4), size AA alkaline batteries
Battery Life	>35 hours continuous typical usage

Accessories (included):
carrying case, test leads, instruction manual, set of four AA alkaline batteries, and a N.I.S.T. calibration certificate.

Kits include the BetaGauge 301 Pressure Calibrator, carrying case, pneumatic pump, connections and fittings.

BetaGauge 301 Ordering Information

Part Number	Description
1919409	BetaGauge 301, -1…1 psi (-70…70 mbar)
1919410	BetaGauge 301, -5…5 psi (-350…350 mbar)
1919411	BetaGauge 301, -15…30 psi (-1…2 bar)
1919412	BetaGauge 301, -12…100 psi (-0.8…7 bar)
1919413	BetaGauge 301, -12…300 psi (0.8…20 bar)
	All units above include • Batteries • Test leads • NIST traceable calibration certificate • User guide • Soft sided carrying case
	Kits with test pumps
1919414	BetaGauge 301, 1 psi kit
1919415	BetaGauge 301, 5 psi kit
1919416	BetaGauge 301, 30 psi kit
1919417	BetaGauge 301, 100 psi kit
1919418	BetaGauge 301, 300 psi kit
	All kits include • Calibrator as above • Hard sided carrying case • MECP100 pneumatic test pump (1, 5, 30, 100 psi ranges) • MECP500 pneumatic test pump (300 psi range) • Fittings and test hose

T-140

is designed to give technicians laboratory-grade accuracy in a rugged, easy-to-use instrument.

The T-140 Pressure Calibrator is available in several ranges; 10" H_2O, 200" H_2O, and 30, 100, 300, and 3,000 psi. Operation of this calibrator is made easy through the use of a sealed membrane keypad with simple controls. When combined with a Martel MECP 100, MECP 500, or MECP 10K Hand Pump, the T-140 Kit makes a great package to handle your pneumatic calibration requirements.

General Features

- High accuracy gauge and differential capability
- Rugged, dust tight, water-resistant case
- Isolated SS sensors on 300 psi and 3,000 psi units
- Easy to read Super-Twist LCD
- Intuitive controls make operation easy, even for infrequent users
- Powered by a common 9 Volt alkaline battery
- Supplied in neoprene sleeve; optional carrying case available

Specifications (18 °C to 28 °C unless otherwise noted)

Ranges	-14 to 30 PSIG/PSID
	-14 to 100 PSIG/PSID
	-14 to 300 PSIG
	-14 to 3,000 PSIG
	± 10" H_2O
	± 200" H_2O
Accuracy	
± 10" H_2O	± 0.1% of F.S.
± 200" H_2O	± 0.05% of F.S.
30 PSI	± 0.05% of F.S.
100 PSI	± 0.05% of F.S.
300 PSI	± 0.05% of F.S.
3,000 PSI	± 0.05% of F.S.
Resolution	
± 10" H_2O	0.001" H_2O
± 200" H_2O	0.01" H_2O
30 PSI	0.001 PSI
100 PSI	0.01 PSI
300 PSI	0.01 PSI
3,000 PSI	0.1 PSI
Engineering Units	PSI, in H_2O, cmH_2O, mH_2O, FtH_2O, mBAR, BAR, inHg, mmHg, cmHg, kg/cm^2, TORR, ATM, KPa
Temperature Stability	±0.01% / FS/°C; 0°C to 18°C, and 28°C to 50°C
Maximum Overpressure	
Ranges≥100 PSI	2x
Ranges≤30 PSI	3x
Ports	See table at right (all 1/8" female NPT)
Media	
30/100 PSI, 10" H_2O	Clean Dry Air or Gas only
200" H_2O	Clean Dry Air or Gas only
300/3,000 PSI	All media compatible with 316 SS
Environmental	
Operating Temperature	0°C to +50°C
Storage Temperature	-20°C to +60°C
Power Requirements	
Battery	(1) 9V alkaline battery,
Mechanical	
Dimensions	5.7" H x 3.5" W x 1.43" D
Weight	14 ounces (396 gms.)

BetaGauge 330 Ordering Information

Part Number	Description	Ports
1919399	T-140 -10…10" WC (-25…25 mbar)	2 (High/Low)
19C1990	T-140 -200…200" WC (-500…500 mbar)	2 (High/Low)
19C1979	T-140 -15…30 psi (-1…2 bar)	2 (High/Low)
19C1982	T-140 -12…100 psi (-0.8…7 bar)	2 (High/Low)
1919056	T-140 -12…300 psi (-0.8…20 bar)	1
1919037	T-140 0…3000 psi (0…200 bar)	1
	All units above include	
	• Batteries	
	• Test leads	
	• NIST traceable calibration certificate	
	• User guide	
	• Soft sided carrying case	
	Kits with test pumps	
19C1990	T-140 200" WC	MECP100 pneumatic test pump
1919001	T-140 30 psi	MECP100 pneumatic test pump
1919002	T-140 100 psi	MECP100 pneumatic test pump
1919096	T-140 300 psi	MECP500 pneumatic test pump
1919098	T-140 3000 psi	MECP10K hydraulic test pump
	All kits include	
	• Calibrator as above	
	• Hard sided carrying case	
	• Test pump as noted	
	• Fittings and test hose appropriate to range	

MARTEL
ELECTRONICS

DPC-30 & DPC-100
Precision pneumatic calibration system
small, lightweight, and accurate - take your test bench to the field!

The Martel DPC-30 & DPC-100 are highly accurate digital calibrators for pneumatic field instrumentation, including valve actuators, P/I transmitters, controllers, gauges, switches, and recorders. It is especially suitable for checking 3 to 15 psi systems. Its dual precision regulators enable output of set and variable pressures to control devices, while the switching manifold allows fast selection among the pressure ports. The unit simultaneously displays pressure and either mA or VDC, and has a built-in loop power supply. Accuracy is 0.035% of full scale for all ranges.

General Features
- Works with compressed plant air
- 0.001 psi resolution, 0.035% accuracy
- Dual digital display – psi & mA or voltage
- Gage, differential, and vacuum modes
- Selectable engineering units
- Pressure switch test
- Rugged case to withstand factory floor environment

DPC-30/DPC-100 Ordering Information

Part Number	Description
1919039	DPC-30, 30 psi/2 bar measurement range
1919119	DPC-100, 100 psi/7 bar measurement range
	All units above include
	• Rechargeable battery pack w/charger (specify primary voltage)
	• Test leads
	• NIST traceable calibration certificate
	• User guide

MECP2000
Portable High Pressure Pneumatic Hand Pump

Finally an alternative to hydraulic pumps or heavy nitrogen cylinders for high pressure calibration!

The new Martel/Beta high pressure hand pump is a revolutionary portable pneumatic pump that can generate pressures up to 2000 psi (140bar) and vacuum to -14 PSI (-0.9bar) quickly *and easily*. The MECP2000 uses a unique dual stage pump design where a low pressure, high volume chamber is used to pre-charge a secondary high pressure chamber. This allows the pump to reach high pressure quickly and with a minimal amount of effort. The pump motion stays smooth through the entire stroke. A precise vernier control allows pressure to be fine tuned with high resolution. The vernier chamber provides enough range so it can be used to generate low pressures (200" H_2O or 500mbar) with no pumping. Both high and low pressure calibrations can be done with one device.

General Features

- Generate -14 psi (-0.9bar) to 2000 psi (140bar) by hand
- Precision vernier allows fine adjustment at both high and low pressures
- Vent valve offers precise control and vents at the pressure connection to prevent pump contaminates
- Use as both a portable or bench-top pump
- Double output manifold with 1/4 NPT female fittings includes BSP adapters
- Extremely rugged design, will stand up to field use
- Isolation valve protects pump and increases fine control range

Applications

- High pressure calibration where hydraulic pumps are not preferable
- Eliminate the need for nitrogen cylinders or use as back-up to nitrogen
- Complete flow computer calibration solution for custody transfer applications
- Bench-top gauge comparator
- General pneumatic calibration

Specifications

Pressure range:	-14 psi (-0.9bar) to 2000 psi (140bar)
Pressure Connections:	2 x ¼ FNPT (2 BSP adapters are included)
Size (without gauge):	21.5" x10.6" x 4.5" / 55cm x 27cm x 11.5cm
Weight:	15 lbs (6.8 kg)

MECP2000 Ordering Information

Part Number	Description
1919967	MECP2000 High Pressure Pneumatic Test Pump with (2) ¼" BSPP adapters, user guide, anti-seize thread lubricant and PTFE thread sealant tape
1920017	MECP2000 Kit with pump, 1010074 hose kit, BSPP adapters, user guide, anti-seize, PTFE tape in 6161255 carrying case
Optional Accessories:	
1010074	High pressure hose kit
1010075	Seal and O-ring repair kit
6161255	Rugged carrying case
80437	Gauge swivel adapter, Quik-Test style

MARTEL
ELECTRONICS

MECP100

Pneumatic & Hydraulic Hand Pumps

The MECP Series of pneumatic and hydraulic test pumps are high performance hand operated pumps that allow the user to generate both pressure and vacuum for precise testing of pressure instrumentation including transmitters, pressure switches, etc.

The pneumatic pumps allow pressures in excess of 100 or 600 PSI (model-dependent) to be generated with just a few strokes of the pump. By changing the switching valve to vacuum, a range of -24" Hg is available.

The output pressure of all pumps can be fine tuned using the vernier control. A precision needle valve allows controlled venting for exacting pressure calibration requirements.

MECP500

All pumps features NPT connections for ease of use. See specifications for details.

In addition to the bare pump, all pump models are offered in kit form with a hard sided carrying case and a flexible connection hose with appropriate fittings.

New improved pump designs have allowed for…

- The MECP10K Hydraulic Pump will work with Hydraulic Oil up to 30 Weight. It's the only one in the industry that can prime oils of this weight.
- The above improvement also allows for much easier priming of the MECP10K
- More volume per stroke on the MECP500 yet still easy to operate at high pressure.
- Improved vent control on the MECP500 allows precise vent control even down at low inches of H_2O.

General Features
- Generate both pressure and vacuum
- Generate –24 "Hg to 100 or 600 PSI, model-dependent
- Generate hydraulic pressure from 0 to 10,000 psi
- Thermally isolated vernier prevents heat transfer from hand
- Precision release valve for bleed control
- Pneumatic pumps include user-friendly, field serviceable, and replaceable check valves
- Ergonomic design makes it easy to pump, even at high pressure
- Pump Rebuild Kits Available, See our video at our website www.martelcalibrators.com

MECP10K

Note, vacuum capability is dependent upon local barometric pressure. Vacuum can be generated to approximately 80% of local barometric pressure.

Specifications (0 °C to +50 °C, unless otherwise noted)

Model	MECP100	MECP500	MECP10K
Operating Pressure Range	-12 to 100 PSI (-0.8 to 7 bar)	-12 to 600 PSI (-0.8 to 40 bar)	0 to 10,000PSI (0 to 700 bar)
Maximum Working Pressure	150 PSI	750 PSI	10,000 PSI
Connection	1, 1/8" FNPT port	1, 1/4" FNPT (top) 1, 1/8" FNPT (side)	2, 1/4" FNPT (top and side) 1, 1/8" FNPT Port (for use with Press. Relief Valve Part # 1010050 Only)
Compatibility	air	air	most hydraulic fluids and oils and water. Hydraulic oil up to 30 weight

MECP100 Kit

MECP500 Kit

Pump Kits shown with optional BetaGauge
PI PRO Digital Test Gauge

MECP10K Kit

Shown with optional
BetaGauge calibrator

MECP-Pumps Ordering Information

Description	Media	Pump Only	Kit
MECP100, -12…100 psi/-0.8…7 bar	Air	80297	1919549
MECP500, -12…600 psi/-0.8…350 bar	Air	80257	1919290
MECP10K, 0…10,000 psi/0…700 bar	Water/Oil	80290	1919406
	All kits above include • Pump • Test hose (range appropriate) • Fittings (range appropriate) • User guide • Hard sided carrying case with custom fit foam		

MARTEL
ELECTRONICS

DMC 1410

Precision "10" Series Calibrators

Work better and get better work with Martel TEN series multifunction calibrators. This family of 5 models scale up to do any size job you need when calibrating process instrumentation.

Start at the top with the DMC-1410 documenting multifunction calibrator. It's versatile, providing access to a complete range of calibration functions while performing automated on the fly calibration data collection and storage. A simple easy-to-use software package is included that allows the user to build a database of all assets that need calibration and download work orders to the calibrator.

Next in line is the MC-1210 multifunction calibrator. It's a rugged and reliable universal calibrator. Like all the others in this series, the MC-1210 is based on the proven reliable, accurate and stable MC-1200. It's dual display and isolated readback allows it to power a transmitter under test while reading its milliamp output. Truly an all-in-one calibrator. The MC-1210 also has a wide range of switch test features for both pressure and temperature switches.

MC 1210

The MC-1010 provides a high level of functions and features at an easy to swallow price for the less demanding user who does not require the isolated read-back feature found on the DMC-1410 or MC-1210.

For those who need specialty temperature calibration with high accuracy, the PTC-8010 is the choice. Special display features show the cold junction temperature and milliVolt equivalents at a glance for thermocouples. Ohms equivalents are shown when using the RTD functions.

The PSC-4010 is a superior loop calibrator with voltage, current and frequency functions. With the best display in the business it makes the essentials of instrument calibration easier than ever. And, a bonus feature not found in other loop calibrators is frequency in and out.

This innovative series features the introduction of a new, high contrast ClearBrite™ graphic display. The display features a vivid white backlight that makes the display easy to read in all light conditions.

MC 1010

All of these models have Martel's easy to learn yet powerful 3 key menu structure. It's the same menu used in all of the company's BetaGauge pressure calibrators, too. Learn it once and you'll know how to use every significant calibrator Martel makes.

General Features
- ClearBrite™ Graphic Display
- Auto Stepping
- Auto Ramping
- RS-232 Serial Interface
- NIST Calibration Certificate
- Rubber Boot
- Martel 3-Key User Interface
- Scroll/Step Output
- Numeric Input
- AC Charger/Adapter Option

PTC 8010

PSC 4010

10 Series Function Table

Function / Model	Documenting	Dual Display	Isolated Readback	Current In/Out	Voltage In/Out	Loop Power	Thermocouple In/Out	RTD/Ω In/Out	Frequency	Pressure+
DMC-1410	●	●	●	●	●	●	●	●	●	●
MC-1210		●	●	●	●	●	●	●	●	●
MC-1010				●	●	●	●	●	●	●
PTC-8010							●	●		
PSC-4010				●	●	●			●	

†with optional BPPA-100 pressure module adapter

10 Series Multifunction Ordering Information

Part Number	Description
1920002	DMC-1410 Documenting Multifunction Calibrator
1919907	DMC-1410PM Panel Mount Documenting Multifunction Calibrator
1920001	MC-1210 Multifunction Calibrator
1919906	MC-1210PM Panel Mount Multifunction Calibrator
1919910	MC-1210-50 Multifunction Calibrator 50 mA range
1919999	MC-1010 Multifunction Calibrator
1919905	MC-1010PM Panel Mount Multifunction Calibrator
1919909	MC-1010-50 Multifunction Calibrator 50 mA range
1920000	PTC-8010 Multifunction Temperature Calibrator
Inquire	PTC-8010PM Panel Mount Multifunction Temperature Calibrator
1919895	PSC-4010 Multifunction Loop & Frequency Calibrator
Inquire	PSC-4010PM Panel Mount Multifunction Loop & Frequency Calibrator
1919908	PSC-4010-50 Multifunction Loop & Frequency Calibrator 50 mA range

All calibrators include
• Calibrator as above
• Deluxe soft sided carrying case
• Test leads
• User Manual
• NIST Traceable Calibration Certificate
• (4) AA Alkaline Batteries

Note: Panel mount option is available on all 50 mA range calibrators. Please inquire.

General Specifications (applies to all models)

Operating Temperature	-10 to 50°C
Storage Temperature	-20 to 70°C
Power	(4) AA Alkaline or optional rechargeable batteries
Low Battery Warning	Yes, on display
ClearBrite™ Display	High contrast 128 x 64 pixel addressable graphic LCD w/daylight backlight 2.4 x 1.8 in. • 63 x 44 mm
Serial Communications	Yes, ASCII, RS-232, requires optional Martel 1919069 serial cable or 1919896 USB cable
CE – EMC	EN50082-1 and EN55022: 1994 Class B
Safety	CSA C22.2 No. 1010-1: 1992
Weight (with batteries)	1.8 lb (0.82 kg)
Size	8.5 x 4.8 x 2.1 in. (22 x 12 x 5.3 cm)
Other	IP54 Protected against misconnection to 250 VAC/VDC

Precision "10" Series Calibrators

DC Voltage and Current

		DC Voltage Upper Isolated	DC Voltage Lower Non-Isolated		DC Current Upper Isolated	DC Current Lower Non-Isolated	
Model		Measurement	Measurement	Source	Measurement	Measurement	Source
DMC-1410	Range	0.000V - 30.000V	0.000V - 20.000V	0.000V - 20.000V	0.000mA - 24.000mA	0.000mA - 24.000mA	0.000mA - 24.000mA
	Accuracy	0.01% ± 2 mV	0.01% ± 2 mV	0.01% ± 2 mV	0.01% ± 2µA	0.01% ± 2µA	0.01% ± 2µA
MC-1210	Range	0.000V - 30.000V	0.000V - 20.000V	0.000V - 20.000V	0.000mA - 24.000mA	0.000mA - 24.000mA	0.000mA - 24.000mA
	Accuracy	0.015% ± 2 mV	0.015% ± 2 mV	0.015% ± 2 mV	0.015% ± 2µA	0.015% ± 2µA	0.015% ± 2µA
MC-1010	Range	N.A.	0.000V - 20.000V	0.000V - 20.000V	N.A.	0.000mA - 24.000mA	0.000mA - 24.000mA
	Accuracy	N.A.	0.015% ± 2 mV	0.015% ± 2 mV	N.A.	0.015% ± 2µA	0.015% ± 2µA
PSC-4010	Range	N.A.	0.000V - 20.000V	0.000V - 20.000V	N.A.	0.000mA - 24.000mA	0.000mA - 24.000mA
	Accuracy	N.A.	0.015% ± 2 mV	0.015% ± 2 mV	N.A.	0.015% ± 2µA	0.015% ± 2µA

Note: optional 50 mA range available

Frequency

Model		Measurement	Source	Measurement	Source	Measurement	Source
DMC-1410	Range	2.0 CPM - 600.0 CPM	2.0 CPM - 600.0 CPM	1.0 Hz - 1000.0 Hz	1.0 Hz - 1000.0 Hz	1.00 kHz - 10.00 kHz	1.00 kHz - 10.00 kHz
	Accuracy	0.05% ± 0.1 CPM	0.05%	0.05% ± 0.1 Hz	0.05%	0.05% ± 0.01 kHz	0.125%
MC-1210	Range	2.0 CPM - 600.0 CPM	2.0 CPM - 600.0 CPM	1.0 Hz - 1000.0 Hz	1.0 Hz - 1000.0 Hz	1.00 kHz - 10.00 kHz	1.00 kHz - 10.00 kHz
	Accuracy	0.05% ± 0.1 CPM	0.05%	0.05% ± 0.1 Hz	0.05%	0.05% ± 0.01 kHz	0.125%
MC-1010	Range	2.0 CPM - 600.0 CPM	2.0 CPM - 600.0 CPM	1.0 Hz - 1000.0 Hz	1.0 Hz - 1000.0 Hz	1.00 kHz - 10.00 kHz	1.00 kHz - 10.00 kHz
	Accuracy	0.05% ± 0.1 CPM	0.05%	0.05% ± 0.1 Hz	0.05%	0.05% ± 0.01 kHz	0.125%
PSC-4010	Range	2.0 CPM - 600.0 CPM	2.0 CPM - 600.0 CPM	1.0 Hz - 1000.0 Hz	1.0 Hz - 1000.0 Hz	1.00 kHz - 10.00 kHz	1.00 kHz - 10.00 kHz
	Accuracy	0.05% ± 0.1 CPM	0.05%	0.05% ± 0.1 Hz	0.05%	0.05% ± 0.01 kHz	0.125%

Resistance Measurement (Autoranging)

Model		Ohms Low	Ohms High
DMC-1410	Range	0.00Ω - 400.00Ω	401.0Ω - 4000.0Ω
	Accuracy	0.015% ± 0.03Ω	0.015% ± 0.3Ω
MC-1210	Range	0.00Ω - 400.00Ω	401.0Ω - 4000.0Ω
	Accuracy	0.025% ± 0.05Ω	0.025% ± 0.5Ω
MC-1010	Range	0.00Ω - 400.00Ω	401.0Ω - 4000.0Ω
	Accuracy	0.025% ± 0.05Ω	0.025% ± 0.5Ω
PTC-8010	Range	0.00Ω - 400.00Ω	401.0Ω - 4000.0Ω
	Accuracy	0.025% ± 0.05Ω	0.025% ± 0.5Ω

PSC-4010 MilliVolts Measurement/Source

Function	Range	Accuracy
Read	0000 mV – 90.000 mV	0.02% ± 10 µV
Source	0.000 mV – 100.000 mV	0.02% ± 10 µV

Resistance Source (Autoranging)

Model	Range	Ohms Source Low Excitation Current	Accuracy	Range	Ohms Source High Excitation Current	Accuracy	Range	Ohms Source High Excitation Current	Accuracy
DMC-1410	5.0Ω - 400.0Ω	0.1 – 0.5 mA	0.015% ± 0.1Ω	401Ω - 1500Ω	0.05 – 0.8 mA	0.015% ± 0.3Ω	1500Ω - 4000Ω	0.05 – 0.4 mA	0.015% ± 0.3Ω
	5.0Ω - 400.0Ω	0.5 - 3 mA	0.015% ± 0.03Ω						
MC-1210	5.0Ω - 400.0Ω	0.1 – 0.5 mA	0.025% ± 0.1Ω	401Ω - 1500Ω	0.05 – 0.8 mA	0.025% ± 0.5Ω	1500Ω - 4000Ω	0.05 – 0.4 mA	0.025% ± 0.5Ω
	5.0Ω - 400.0Ω	0.5 - 3 mA	0.025% ± 0.05Ω						
MC-1010	5.0Ω - 400.0Ω	0.1 – 0.5 mA	0.025% ± 0.1Ω	401Ω - 1500Ω	0.05 – 0.8 mA	0.025% ± 0.5Ω	1500Ω - 4000Ω	0.05 – 0.4 mA	0.025% ± 0.5Ω
	5.0Ω - 400.0Ω	0.5 - 3 mA	0.025% ± 0.05Ω						
PTC-8010	5.0Ω - 400.0Ω	0.1 – 0.5 mA	0.025% ± 0.1Ω	401Ω - 1500Ω	0.05 – 0.8 mA	0.025% ± 0.5Ω	1500Ω - 4000Ω	0.05 – 0.4 mA	0.025% ± 0.5Ω
	5.0Ω - 400.0Ω	0.5 - 3 mA	0.025% ± 0.05Ω						

RTD Measurement/Source
(DMC-1410, MC-1210, MC-1010 and PTC-8010 only)

RTD Type	Range (°C)	DMC-1410 Accuracy (°C)	MC-1210, MC-1010, PTC-8010 Accuracy (°C)
PT385, 10Ω	-200.0 – -80.0	0.76	1.3
	-80.0 – 0.0	0.78	1.3
	0.0 – 100.0	0.83	1.4
	100.0 – 300.0	0.92	1.5
	300.0 – 400.0	0.98	1.6
	400.0 – 630.0	1.05	1.8
	630.0 – 800.0	1.16	1.9
PT385, 50Ω	-200.0 – -80.0	0.16	0.3
	-80.0 – 0.0	0.23	0.4
	0.0 – 100.0	0.23	0.4
	100.0 – 300.0	0.23	0.4
	300.0 – 400.0	0.27	0.5
	400.0 – 630.0	0.30	0.5
	630.0 – 800.0	0.36	0.6
PT385, 100Ω	-200.0 – -80.0	0.08	0.1
	-80.0 – 0.0	0.13	0.2
	0.0 – 100.0	0.14	0.2
	100.0 – 300.0	0.15	0.2
	300.0 – 400.0	0.18	0.3
	400.0 – 630.0	0.21	0.3
	630.0 – 800.0	0.26	0.4
PT3926, 100Ω	-200.0 – -80.0	0.07	0.1
	-80.0 – 0.0	0.10	0.2
	0.0 – 100.0	0.11	0.2
	100.0 – 300.0	0.13	0.2
	300.0 – 400.0	0.17	0.3
	400.0 – 630.0	0.19	0.3
PT3916, 100Ω	-200.0 – -80.0	0.07	0.1
	-80.0 – 0.0	0.10	0.2
	0.0 – 100.0	0.11	0.2
	100.0 – 260.0	0.13	0.2
	260.0 – 300.0	0.17	0.3
	300.0 – 400.0	0.17	0.3
	400.0 – 630.0	0.19	0.3
PT385, 200Ω	-200.0 – -80.0	0.35	0.6
	-80.0 – 0.0	0.40	0.7
	0.0 – 100.0	0.42	0.7
	100.0 – 260.0	0.45	0.7
	260.0 – 300.0	0.45	0.7
	300.0 – 400.0	0.52	0.9
	400.0 – 630.0	0.53	0.9
PT385, 500Ω	-200.0 – -80.0	0.15	0.2
	-80.0 – 0.0	0.18	0.3
	0.0 – 100.0	0.19	0.3
	100.0 – 260.0	0.21	0.4
	260.0 – 300.0	0.25	0.4
	300.0 – 400.0	0.26	0.4
	400.0 – 630.0	0.29	0.5
PT385, 1000Ω	-200.0 – -80.0	0.10	0.2
	-80.0 – 0.0	0.12	0.2
	0.0 – 100.0	0.14	0.2
	100.0 – 260.0	0.14	0.2
	260.0 – 300.0	0.17	0.3
	300.0 – 400.0	0.19	0.3
	400.0 – 630.0	0.22	0.4
NI120	-80.0 – 260.0	0.6	0.1
Cu10	-100.0 – 260.0	0.77	1.3
Cu50	-180.0 – 200.0	0.16	0.3
Cu100	-180.0 – 200.0	0.08	0.1
YSI400	15.0 – 50.0	0.05	0.1

Accuracy statements are based on 4W connections

mV/Thermocouples (DMC-1410, MC-1210, MC-1010 and PTC-8010 only)

MilliVolts (mV)	Range	DMC-1410 Accuracy	MC-1210, MC-1010, PTC-8010 Accuracy
Read	-10.000 mV – 75.000 mV	0.015% ± 10 μV	0.02% ± 10 μV
Source	-10.000 mV – 75.000 mV	0.015% ± 10 μV	0.02% ± 10 μV

Maximum current output in voltage ranges is 1 mA with an output impedance of ≤ 1 Ω

TC Type	Range (°C)	Accuracy (°C) With CJC OFF	With CJC ON
J	-210.0 – 0.0	0.4	0.6
	0.0 – 800.0	0.2	0.4
	800.0 – 1200.0	0.3	0.5
K	-200.0 – 0.0	0.6	0.8
	0.0 – 1000.0	0.3	0.5
	1000.0 – 1372.0	0.5	0.7
T	-250.0 – 0.0	0.6	0.8
	0.0 – 400.0	0.2	0.4
E	-250.0 – -100.0	0.6	0.8
	-100.0 – 1000.0	0.2	0.4
R	0 – 1767	1.2	1.4
S	0 – 1767	1.2	1.4
B	600 – 800	1.2	1
	800 – 1000	1.3	1.5
	1000 – 1820	1.5	1.7
C	0 – 1000	0.6	0.8
	1000 – 2316	2.3	2.5
XK	-200.0 – 800.0	0.2	0.4
BP	0.0 – 800.0	0.9	1.1
	800.0 – 2500.0	2.3	2.5
L	-200.0 – 0.0	0.3	0.5
	0.0 – 900.0	0.2	0.4
U	-200.0 – 0.0	0.5	0.7
	0.0 – 600.0	0.3	0.5
N	-200.0 – 0.0	0.8	1.0
	0.0 – 1300.0	0.4	0.6

DMC 1410

Notes
All specifications apply at 23°C ± 5°C unless otherwise stated. Outside of this range add ±0.005% of reading/°C.

Accuracy is % of reading ± floor spec.

Maximum current output in voltage ranges is 1 mA with an output impedance of ≤ 1Ω.

Maximum load on mA source is 1000Ω. Voltage input range on simulate mode 5 – 30 V.

Frequency input voltage amplitude range is 1V to 20V zero based square wave only. Output amplitude is adjustable from 1V to 20V, and is a square wave with 50% duty cycle. For output frequency, a negative offset of approximately -0.1V is present to assure zero crossing.

In Ohms source and RTD source modes, units are compatible with smart transmitters and PLCs that use a strobing excitation current. Frequency response is 5 msec.

Millennium Series **3001**
Lab Standard Multi-Function Precision Calibrator

The Martel 3001 precision calibrator combines the power and features of the M2001 (voltage, current, TC, RTD and pressure) with a second completely isolated measurement channel for a single laboratory calibration instrument unmatched in versatility, performance, and value. As with every Martel calibrator, the 3001's world-class performance and features are accessed through a very simple-to-use, intuitive user interface. The Martel 3001 is truly a "process calibration laboratory in a box."

General Features

- Superior calibration accuracy to 0.0025% of reading
- Direct keyboard entry or cursor entry with decade control
- Source/Read thermocouple (13), RTD (9), Voltage, Current, Pressure (read only)
- Custom RTD and SPRT profiles
- Nine (9) setpoints for each output range and type
- Beryllium-Copper binding posts reduce thermal EMFs
- RS232, USB and IEEE-488 remote control
- Compatible with Fluke Met/Cal® software
- Isolated measurement channel
    - Two (2) voltage ranges: 10V and 100 VDC
    - MilliAmp range 0 to 52 mA
    - MilliAmp range with simultaneous 24 VDC power
    - Selectable 250 Ohm HART™ resistor
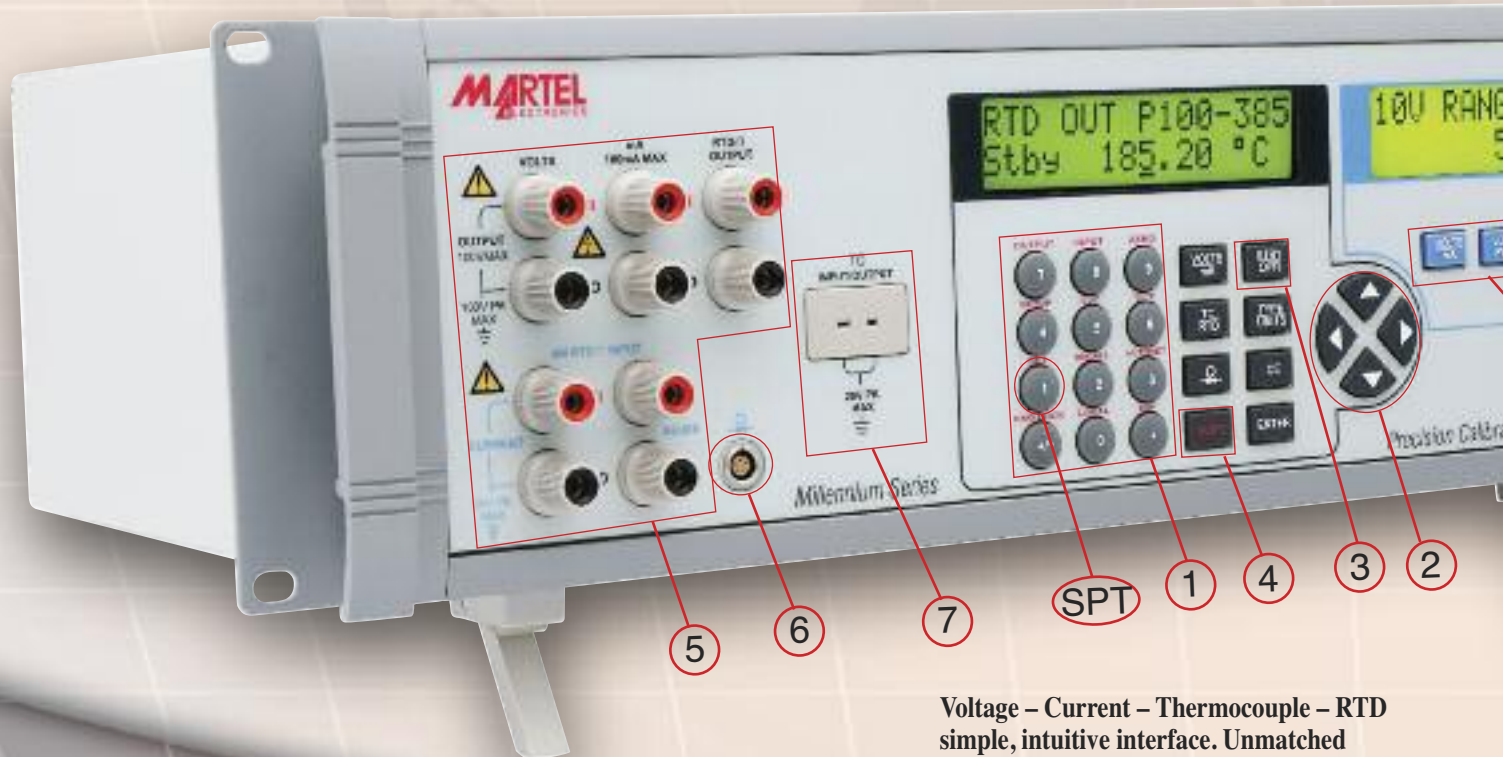   - Accuracy of 0.005% of reading on voltage ranges

Simple, Intuitive Interface

The 3001 provides simple, front-panel entry of mode, range, and value, using either direct key-board entry (1) or cursor entry (2). Using cursor entry, the LEFT/RIGHT arrow keys are used to move the cursor under the digit in the display to be changed. The UP/DOWN arrow keys increment/decrement the value at the cursor position. Using direct keyboard entry (1), the exact value desired is entered using the numeric keys, and the ENTER key is pressed to set the output to that value. Whichever way you choose, setup is simple and fast. In the voltage output mode, the 3001 auto-ranges on the entered value for maximum accuracy at all times.

The Performance You Demand – In Any Mode
Voltage Mode
The 3001 offers four precision voltage output ranges (100mV, 1V, 10V, and 100V) all with 0.003% (30ppm) accuracy. These ranges are ideal for calibrating a broad range of DC voltage instrumentation. Additionally all voltage outputs settle to full specification in less than 200ms making the 3001 ideal for automated calibration systems.

Voltage – Current – Thermocouple – RTD simple, intuitive interface. Unmatched performance. The Martel 3001 – process calibration laboratory in a box.

An automatic stand-by mode (3) assures that output voltages above 30VDC must be acknowledged by the operator before the voltage appears at the output jacks. The stand-by mode is also triggered if the output current compliance is exceeded, thereby protecting the device under calibration.

Current Mode

The 3001 features a precision current output range (100mA) that offers 0.01% (100ppm) accuracy, which is ideal for calibrating process instrumentation especially 4 to 20mA equipment. With a full 12 volts of compliance at 100mA virtually any precision DC current measuring device can be calibrated using the 3001. Like the voltage ranges the current range offers quick settling time and an operate/stand-by mode.

Thermocouple Mode

The Martel 3001 can read and source any of 11 types of thermocouples. Its T/C input and output is Cold Junction Compensated, using an ultra-stable PT-1000 sensor.

RTD Mode

The 3001 can read and source 9 RTD types as well as YSI-400 and Ohms for non-standard curves. Probe coefficients (A, B, C, and R0) can be entered directly, with storage for up to five custom curves and one SPRT curve. The performance of the 3001 in the RTD mode compares to dedicated RTD measurement instruments. Unlike low-cost, less accurate RTD instruments, the display in the 3001 is always active, reading to three decimal places, using polynomial averaging to extract a high accuracy signal. The result is a very quiet, high accuracy reading.

Pressure Mode

The 3001 operates with all Martel BetaPort series pressure modules using the BPPA module adapter and covers pressure ranges from 0 to 10" H_2O to 10,000 psi. Pressure can be displayed in a wide range of engineering units with up to 0.025% Full Scale accuracy. The 3001 also supports Fluke 700 series modules and Mensor 6100 precision pressure modules.

Total Setpoint Control

A SHIFT key (4) provides easy access to the setpoint controls of the 3001. Up to nine setpoints can be defined for each output mode and each thermocouple and RTD type. Setpoints are recalled individually at the touch of three buttons, SHIFT (4), SETPOINT (SPT) button and then the corresponding numeric keys 1-9. Any number of sequential setpoints can be stepped through automatically, with complete control of dwell time. Either way, for rapid setup of repeatable tests, no other instrument comes close to the Martel 3001.

Remote Control

All of the 3001 operating functions can be accessed via RS-232, IEEE-488 or USB using a standard PC running Fluke Met/Cal® software, Windows® HyperTerminal or other software using an ASCII protocol. Custom control programs may be written using programming software such as C++. Switching between LOCAL and REMOTE is as simple as touching the SHIFT (4) and LOCAL buttons.

Rock-Solid Stability

The 3001 stability and accuracy is traceable to NIST standards. The accuracy of the 3001 is specified for both 90-day and one-year intervals. Manual zero calibrations can be made on all T/C and pressure functions to eliminate offsets.

Flexible Output

Five-way copper alloy binding posts (5) provide a wide range of connection options. A standard pressure module connector is provided (6), as is the CJC T/C mini-jack (7).

Isolated Measurement Channel

The 3001 features a fully isolated measurement channel which allows the user to calibrate process transmitters and signal isolators. In reality it's like having two instruments in one! This channel also incorporates a 24 volt loop power supply to power 2-wire transmitters and a HART interface resistor enabling direct connection to HART communicators.

Key features are:
- Two voltage ranges 10V and 100V DC
- Milliamp range 0 to 52mA
- Milliamp range with simultaneous 24 volt power (0 to 24ma)
- Selectable 250 ohm HART resistor
- Accuracy of 0.005% of reading on all ranges

Specifications (1 year at 23°C ±5°C; % of reading, unless otherwise noted)

Output Voltage

Range

0 to 100.000 mV	
0 to 1.00000 V	
0 to 10.0000 V	
0 to 100.000 V	

Resolution

0 to 100 mV Range	1 μV
0 to 1 V Range	10 μV
0 to 10 V Range	100 μV
0 to 100 V Range	1 mV

Accuracy (% of reading)

0 to 100 V Range	±0.003% (30ppm) ± 3 μV
0 to 1 V Range	±0.003% (30ppm) ± 10 μV
0 to 10 V Range	±0.003% (30ppm) ± 100 μV
0 to 100 V Range	±0.003% (30ppm) ± 1 mV

Maximum Burden (~ 1 Ohm output impedance)

0 to 100 mV Range	10 mA
0 to 1 V Range	10 mA
0 to 10 V Range	10 mA
0 to 100 V Range	1 mA

Output Current

Range	0 to 100.000 mA
Resolution	1 μA
Accuracy (% of reading)	± 0.005% ± 1 Count
Maximum Burden	10 V

Thermocouples

Output

Types	J, K, T, E, R, S, N, B, L, U, C, BP, XK
Range	mV
Resolution	0.1 °C/°F
Accuracy	0.14 °C; Type J, typical

Input

Types	J, K, T, E, R, S, N, B, L, U, C, BP, XK
Range	mV
Resolution	0.01 °C/°F
Accuracy	0.14 °C; Type J, typical

RTD

Output

Range	Pt385 (100, 200, 500, 1000), Pt392, Pt3916 (JIS), Ni120, Cu 10, YS I400
Resolution	0.01 °C/°F; Pt385-1 00, typical
Accuracy	±0.05 °C; Pt385-100, typical

Input (All RTD inputs are 4 wire)

Range	Pt385 (100, 200, 500, 1000), Pt392, PT3916 (JIS), Ni120, Cu10, YSI400, 25 Ohm SPRT
Resolution	0.001 °C/°F; Pt385-100, typical
Accuracy	±0.02 °C; Pt385-100, typical

Ohms

Output

Range	5 to 4000.0 Ω	
Resolution	5 to 400.00 Ω	0.001 Ω
	5 to 4000.0 Ω	0.01 Ω
Accuracy		
	5 to 400.00 Ω	±0.05 Ω
	5 to 4000.0 Ω	±0.3 Ω

Input (4 wire connection)

Range	0 to 4000.00 Ω	
Resolution	0 to 400.00 Ω	0.001 Ω
	0 to 4000.0 Ω	0.01 Ω
Accuracy		
	0 to 400.00 Ω	40 PPM ±0.002 Ω
	0 to 4000.00 Ω	40 PPM ±0.02 Ω

Pressure

Range	0 to 1 inch H_2O; to 10,000 psi
Compatibility	All BetaPort modules using the BPPA adapter and all Fluke 700 and Mensor 6100 Series Pressure Modules

Isolated Measurement Channel

Range	Accuracy
0-10.0000V	±0.005% ± 0.2mV
0-100.000V	±0.005% ± 2.0mV
0-52.0000mA	±0.01% ± 1μA
Loop power:	24 V ± 10%
HART™ resistor:	250Ω ± 3%
Maximum current:	24 mA

Stability

Warm-up Time	30 minutes to rated accuracy
Temp Co. (~18°C/>28°C)	10% of accuracy spec/°C

Environmental

Operating Temperature	0°C to +50°C
Storage Temperature	-20°C to +70°C
Humidity	
Operating	<80% to 30°C
	<70% to 40°C
	<40% to 50°C
Storage	<95%, non-condensing

Power Requirements

Voltage Range	90 to 240 VAC
	<15 VA

Mechanical

Dimensions	5"h x 19"w x 11"d (17.7 cm x 48.26 cm x 27.96 cm)
Weight	10.5 lbs. (4.8 kg)
Display	(2) Large character 16 by 2 line alphanumeric backlit LCDs

Optional RTD Probe

The Martel IBP-1 high-accuracy RTD probe is supplied with R0, A, B, and C coefficients to provide the maximum possible accuracy for critical calibration requirements.

Probe Type	PT-100 Alpha 385
Temperature Range	-100°C to +400°C
Accuracy	±0.025°C
Stability	±0.025°C at 0° for 1 year
	±0.05°C at 0°C for 5 years
Dimensions	0.25" OD, 14 inches
Cable	3.5'

3001 Ordering Information

Part Number	Description
1919548	Martel 3001 Precision Bench Calibrator, 120 VAC power
1919628	Martel 3001 Precision Bench Calibrator, 240 VAC power
	Optional Accessories
6565073	IBP-2 High accuracy RTD probe with data
1919179	BPPA-100 BetaPort-P pressure module adapter
80055	PTL-1B low EMF Beryllium Copper test lead (single, black)
80056	PTL-1R low EMF Beryllium Copper test lead (single, red)
80029	T/C wire kit J, K, T, E w/mini plugs, 3'/1 m length each
80036	T/C wire kit R/S, N, B w/mini plugs, 3'/1 m length each
	Martel 3001 includes
	• Calibrator as above
	• North American style power cord (120 VAC version)
	• European style power cord (240 VAC version)
	• User Manual
	• NIST Traceable Calibration Certificate

Millennium Series **M2000A**
Lab Standard Voltage/Current Bench Calibrator

The Martel M2000A Bench Calibrator sets a new standard in lab calibrator value – the M2000A features the accuracy and stability of calibration sources costing twice as much – and provide useful features no other calibrator offers in its class! Despite its world-class performance and powerful operating features, the M2000A Calibrator is very simple to setup and use.

General Features
- Superior calibration accuracy
- Direct keyboard entry or cursor entry with decade control
- Automatic standby function protects device under test
- Nine (9) manual/automatic setpoints per output range
- Local or RS232 remote control
- IEEE-488 (GPIB) port included
- Compatible with Fluke Met/Cal® software
- Optional rack/panel mount kit available

Simple Data Entry
The M2000A provides simple, front-panel control of output voltage or current using either direct keyboard entry or cursor entry.

The M2000A calibrator has an automatic OPERATOR/STANDBY function, which not only protects the device under test and the M2000A from overload conditions, but also provides UL/CSA-certified safe operation when ranging to output voltages over 30V.

A second function key provides easy access for up to nine setpoints for each output range that can be recalled individually at the touch of a button, or can be stepped through automatically with control of the setpoint dwell time.

Remote Control
All of the M2000A operating functions can be accessed via RS232 using a standard PC running Fluke Met/Cal® software, Windows® HyperTerminal, Visual Basic or any other software using an ASCII interface. An IEEE-488 bus interface is also standard.

Rock solid
The M2000A stability and accuracy is traceable to NIST standards. The accuracy of the M2000A is specified for both 90-day and one-year interals.

Specifications (1 year at 23°C ±5°C; % of reading, unless otherwise noted)

Output Voltage

Range & Resolution

0 to 100 mV Range	1 μV
0 to 1 V Range	10 μV
0 to 10 V Range	100 μV
0 to 100 V Range	1 mV

Accuracy (% of reading)

0 to 100 mV Range	±0.003% (30 ppm) ± 3.0 μV
0 to 1 V Range	±0.003% (30 ppm) ± 20.0 μV
0 to 10 V Range	±0.003% (30 ppm) ± 200.0 μV
0 to 100 V Range	±0.003% (30 ppm) ± 2.0 mV

Maximum Burden (~ 1 Ohm output impedance)

0 to 100 mV Range	10 mA
0 to 1 V Range	10 mA
0 to 10 V Range	10 mA
0 to 100 V Range	1 mA (10 mA @ 24 VDC)

Output Current

Range	0 to 100.000 mA
Resolution	1 μA
Accuracy (% of reading)	± 0.01% ± 2 μA
Maximum Burden	10 V

Stability

Warm-up Time	30 minutes to rated accuracy

Temperature Coefficient (~18°C/>28°C)
10% of accuracy spec/°C

Temperature Range

Operating	0°C to +50°C
Storage Temperature	-20°C to +70°C

Power Requirements

Voltage Range	90 to 240 VAC (factory set)

Mechanical

Dimensions	11.5"h x 4.7"w x 8.75"d
	(29.21 cm x 11.83 cm x 22.00 cm)
Weight	5 lbs. (2.27 kg)
Display	(16) Large characters x 2 lines
	Alphanumeric, backlit high contrast LCD

M2000A Ordering Information

Part Number	Description
1919092	Martel M2000A Precision V/I Source Calibrator, 120 VAC power
1919138	Martel M2000A Precision V/I Source Calibrator, 240 VAC power
	Optional Accessories
80055	PTL-1B low EMF Beryllium Copper test lead (single, black)
80056	PTL-1R low EMF Beryllium Copper test lead (single, red)
	Martel M2000A includes
	• Calibrator as above
	• North American style power cord (120 VAC version)
	• European style power cord (240 VAC version)
	• User Manual
	• NIST Traceable Calibration Certificate

T-150
Precision Frequency Calibrator

The T-150 frequency calibrator can generate or read frequencies ranging from 1 count per minute to 100 kHz allowing it to be used for a wide range of flow measuring instrumentation.

The Tuff-Tools line of calibrators is designed to give the technician laboratory grade accuracy in a family of rugged, easy to use instruments.

Operation of this calibrator is made easy through the use of a sealed membrane keypad with simple controls. The outputs are set through the use of step and ramp keys which allows both large and small output changes to be made with ease.

Specifications (1 year at 23 °C ±5 °C; % of reading unless otherwise noted)

Ranges:	0-100.0 kHz 0-1000.0 Hz 0-1000.0 CPM
Accuracy[1]:	± 0.01% F.S. ± 1 LSD
Max Load Driving:	5 mA (1 K Ohm load min)
Operating Temp.:	0 to 50°C
Storage Temp.:	-20 to 60°C
Temperature Stability[2]:	.005% F.S./°C
Output Signal:	5 V p-p square wave
Input Signal:	1 V to 100 V p-p
Step Size:	10% of range
Scroll Size:	0.1% of Range
Weight:	12 oz. / 340 g
Size:	1.43" x 3.15" x 5.7" (3.6 cm x 8 cm x 14.5 cm)

Note 1: 18°C to 28°C
Note 2: 0 to 18°C and 28°C to 50°C

General Features
- High Accuracy
- Source and Read Capability
- Rugged, Dust Tight, Water Resistant Case
- Easy to Read Super-Twist LCD
- Intuitive Controls make operation easy even for infrequent users
- Powered by a common 9 Volt battery

T-150 Ordering Information

Part Number	Description
19C1977	T-150 Tuff Tools Frequency Calibrator
	Includes • Calibrator as above • User Manual • NIST Traceable Calibration Certificate • Protective sleeve case • Test leads • 9V Alkaline battery

LC-110 & LC-110H
Precision Current Loop Calibrator with HART Communications/Diagnostics

The Martel LC-110 and LC-110H are mA (loop) calibrators designed to take the loop calibrator class to the next level. The new LC-110 series features a user friendly interface with dedicated buttons and a rotary encoder (Quick-Set Knob). This combination dramatically reduces the time it takes to measure, or source voltage or current and power up a loop. The rugged case is contoured to easily fit a technician's hand and the large back lit graphics LCD is best in class.

The LC-110H differs from the standard LC-110 in that it incorporates HART communications and supports a select set of the HART universal and common practice commands. This unique feature allows the LC-110H to be used as both a loop calibrator and communication tool.
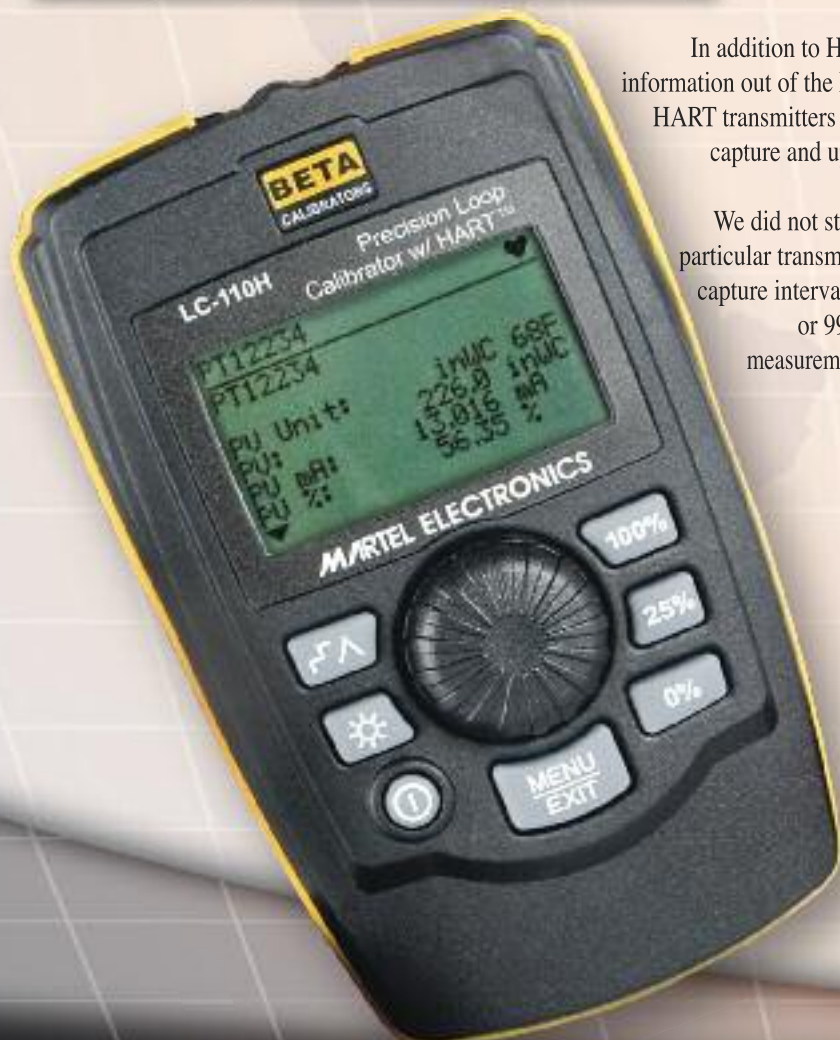
In the communicator mode the user will be able to read basic device information, perform diagnostic tests, and trim the calibration on most HART enabled transmitters. In the past, this could only be done with a dedicated communicator, high-end multifunction calibrator costing thousands of dollars, or a laptop computer with HART modem. The LC-110H will allow many more technicians to service and support HART devices.

In addition to HART communications, we also gave the user the ability to get information out of the LC-110H. Need to quickly document the parameters of all the HART transmitters in your plant? Just add the BetaLOG HART software/cable to capture and upload to twenty configurations in either (.csv) or (.txt) format.

We did not stop there! How about the ability to data log or record data on a particular transmitter for troubleshooting? The data log tool features selectable capture interval from 1 to 60 seconds and a logging capacity of 9800 records or 99 individual sessions. Each data sample contains the LC-110H measurement, all four process variables, and the standard status conditions.

LC110 Series Ordering Information
Each unit comes standard with batteries, manual, test leads (banana to alligator clips), and NIST Cert with Data

Part Number	Description
1919974	LC110 Loop Calibrator
1920024	LC110H Loop Calibrator with HART™ Communications
1920050	BetaLOG HART Software with Lemo to USB Cable
6161102	Soft Carrying Case
1920051	LC110H Loop Calibrator Kit:
	BetaLOG HART Software with Lemo to USB Cable
	Soft Carrying Case
	Banana to Mini-grabber® Test Leads
1920049	Lemo to USB Cable
5353050	Test Leads (1 Pair – Banana to Alligator)
5353093	Test Leads (1 Pair – Banana to Minigrabber®)

General Features
- Best in Class Accuracy at 0.01% Reading
- Small Rugged design operates on (6) standard AAA batteries
- Intuitive interface that features a Quick-Set Knob
- 24VDC loop power with mA Measure Mode (-25% to 125%)
- Resolution of $1\mu A$ on mA ranges and 1mV on voltages ranges
- Built in selectable 250Ω Resistor for HART communications
- Simple two wire connection for all measurements
- Auto Shutdown to conserve battery life (adjustable up to 30 minutes)
- Variable step & ramp time in seconds
- Adjustable span selection (0 to 20mA or 4 to 20mA)
- Valve Test (simulate defined mA values with % keys)

Specifications

Model LC-110 & LC-110H

Functions: mA source, mA simulate, mA read, mA read/loop power, and volts read.

Ranges: mA (0 to 24mA) and Volts (0 to 30VDC)

Resolution: 1uA on mA ranges and 1mV on voltage range

Accuracy: 0.01% +/- 2LSD all ranges (@23° +/- 5°C)

Operating Temp range: -10°C to 55°C

Humidity range: 10 to 95% non-condensing

Stability: 20ppm of F.S. /°C from -10°C to 18°C and 28°C to 55°C

Display: 128 x 64 pixels, LCD Graphic w/backlight, .34" high digits

Power: 6AAA alkaline, lithium, or NiMH batteries

Battery Life: ≥ 40 hours continuous use (measure mode using alkaline)

Loop Compliance Voltage: 24VDC @ 20mA

Over-Voltage Protection: 240VAC

Overload Current Protection: 28mA DC

EMC: EN61326 Annex A (Portable Instruments)

Dimensions (L x W x D): 6" x 3.6" x 1.3" (15 cm x 9 cm x 3 cm)

Weight: 9.5 ounces (0.3 kg)

Included Accessories: NIST traceable calibration certificate with data, batteries, test leads, and manual

Additional Features (LC110H)

• Built in HART modem for communication capability to perform the following commands:
- Read Message
- Read Tag, Descriptor, Cal Date
- Read Sensor PV info.
- Read PV Output info.
- Read Long Tag
- Write PV Ranges (Upper and Lower)
- Enter/Exit Fixed Current Mode
- Set Zero Offset
- Trim DAC Zero
- Trim DAC Gain

• The ability to store up to twenty HART device configuration files for uploading via the BetaLOG Hart software. Configurations can be stored as .csv or .txt files. This allows the end user to document the entire plant for HART devices without spending thousands of dollars for plant asset management software.

LC-110 & LC-110H

Operation

The LC-110 & LC-110H utilizes a rotary encoder (Quick-Set Knob) to set the output (mA) and also to select the function to implement. The Quick-Set Knob features an integral push button that you press to enter a selection. A dedicated menu key brings up a list of functions. The Quick-Set interface highlights an item on that list, and then pressing the knob (clicking it) selects that item to drive further in the menu. The "Menu/Exit" key is used to go back to the previous menu or exit from menu structure into measure/source mode. All functions and HART commands are accessed in this manner. When used as mA calibrator only, there are dedicated keys for automatic step and ramp generation as well as keys to perform a quick zero and span (4mA, 20mA and 25% steps).

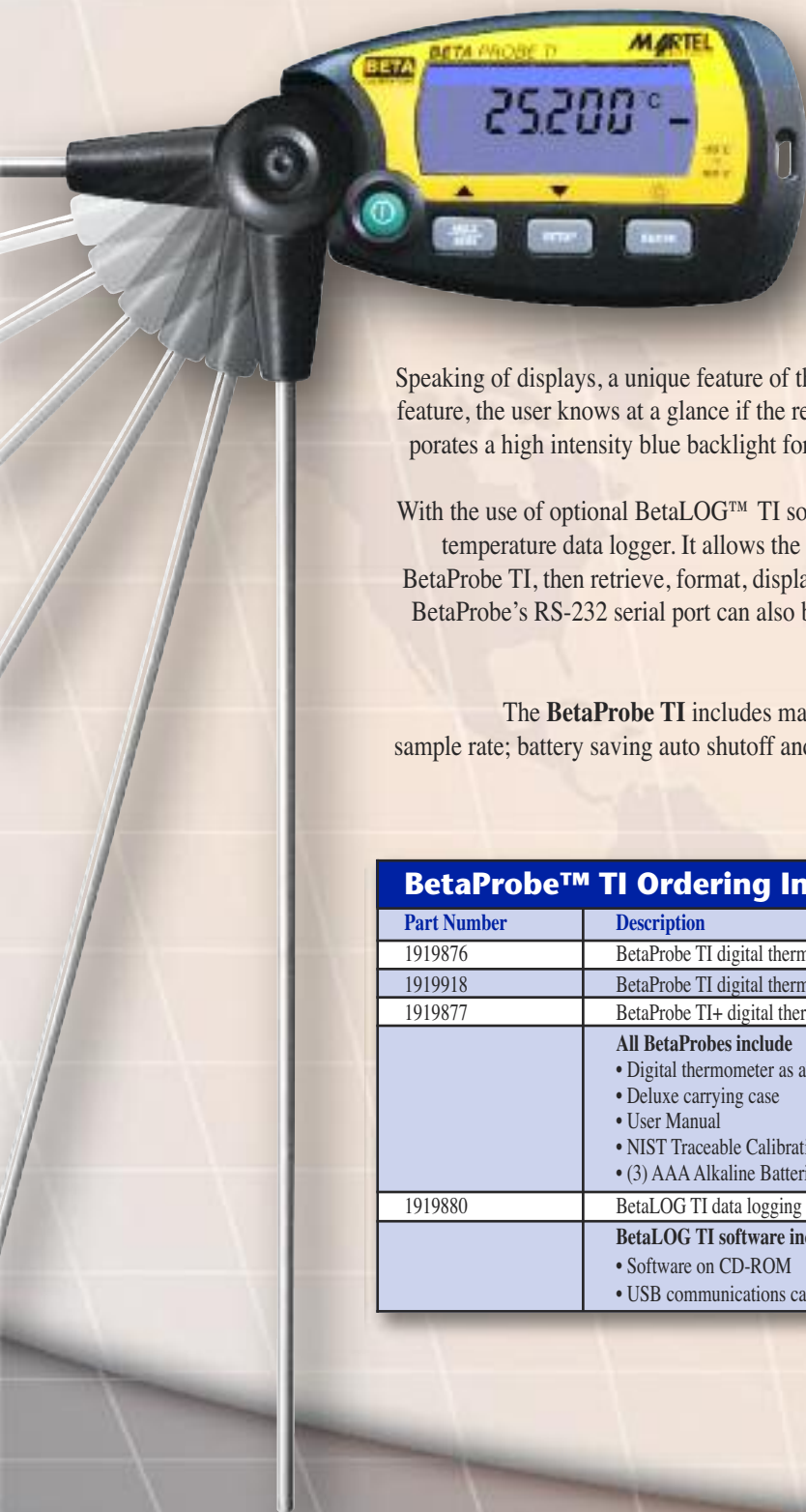**HART**
COMMUNICATION PROTOCOL

New Features!
• Write long tags
• Write short tags
• Edit PV units

The BetaProbe™ TI
High Precision Digital Thermometer

A single **BetaProbe TI high precision digital thermometer** can replace many liquid-in-glass (l-i-g) thermometers. It can also serve as a reference standard for other types of digital or analog temperature indicators. Plus, intrinsically safe certification means it can be used virtually anywhere.

The integral 3/16" (5 mm) diameter probe houses a quick response thin film sensor for quickly acquiring highly accurate readings using minimal insertion depth. The integral probe also rotates through 90° for any angle reading of the display.

Speaking of displays, a unique feature of the **BetaProbe TI** is the user configurable trend indicator. With this feature, the user knows at a glance if the reading is stable or trending higher or lower. The display also incorporates a high intensity blue backlight for easy reading in any lighting condition from full sun to pitch dark.

With the use of optional BetaLOG™ TI software, the BetaProbe TI becomes a high performance, easy to use temperature data logger. It allows the user to create a full suite of logging options, download them to the BetaProbe TI, then retrieve, format, display and save the data using Microsoft® Excel spreadsheet files. The BetaProbe's RS-232 serial port can also be used for configuration and recalibration support via Windows™ HyperTerminal.

The **BetaProbe TI** includes many other features including Min/Max storage and recall; selectable sample rate; battery saving auto shutoff and damping. Battery life of 250+ hours of continuous use means the three AAA alkaline batteries will seldom need changing.

BetaProbe™ TI Ordering Information

Part Number	Description
1919876	BetaProbe TI digital thermometer with 12" (30 cm) probe
1919918	BetaProbe TI digital thermometer with 18"(45 cm) probe
1919877	BetaProbe TI+ digital thermometer with 18" (45 cm) probe
	All BetaProbes include • Digital thermometer as above • Deluxe carrying case • User Manual • NIST Traceable Calibration Certificate • (3) AAA Alkaline Batteries
1919880	BetaLOG TI data logging software for BetaProbe TI/TI+
	BetaLOG TI software includes • Software on CD-ROM • USB communications cable

General Features
- Low total cost of ownership (TCO) compared to L-I-G thermometers
- High accuracy (± 0.06°C)
- High resolution (0.001°C)
- Hazardous area use rating
- Fast response
- Data logging with optional BetaLOG™ TI software
- Temperature trend indicator
- Rugged and reliable
- EFI/RFI standard compliant
- Long battery life
- User configurable features
- Compact and lightweight

Specifications (18°C to 28°C unless noted)

Range
-50 to 160°C (-58 to 320°F)

Accuracy (1 year)
±0.06°C (0.1°F)

Resolution
0.1, 0.01, 0.001 (user selectable)

Sample Rate
0.5/sec, 1/sec, 2/sec (user selectable)

Environmental
Operating Temperature	-10 to 50°C
Operating humidity	0 to 95% RH non-condensing
Storage Temperature	-20 to 60°C
Enclosure	IP50

Environmental Effect
±10 ppm/°C from -10 to 18°C and 28 to 50°C

EMC Compliance
EN 61326:2006 Annex C,
CISPR II, Edition 5.0-2009 Class "B"

Power
Battery three (3), size AAA alkaline batteries
Use only approved batteries to maintain intrinsic safety rating
Battery Life 250+ hours continuous without backlight use

Auto Shutoff
User configurable 1 to 30 minutes or disabled

Size (readout only)
4" x 2" x 1" (10 cm x 5 cm x 3 cm)

Probe
3/16" diameter x 12" length (5 mm x 300 mm)
Other sizes upon request

Weight
6.9 oz (75 g)

Accessories
Includes: manual, NIST traceable calibration certificate, batteries,
protective carrying case (shown below)

CE

Ex

II 2 G

Ex ib IIB T4 Gb (-10˚C ≤ Ta ≤ +50˚C)
ITS10ATEX27114X
Ex ib IIB T4 Gb
IECEx ITS10.0049X

BetaLOG TI Data Logging Software

The optional BetaLOG TI software turns the BetaProbe TI into a high performance, easy to use temperature data logger. With the convenience of its integral probe and the small and lightweight nature of the readout head, it fits a wide range of applications.

When the data logging feature is turned on, the BetaProbe can store up to 10,752 readings.
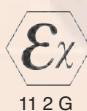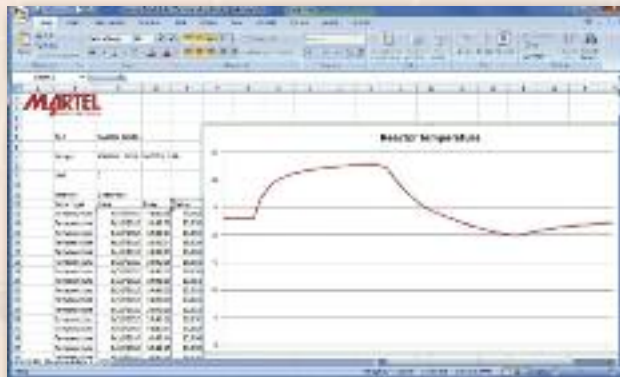
Configuration options include:
• Interval selections from 1 second to 1 minute
• Runs can range from a few seconds to several days
• Data capture mode types
  • Average/Minimum/Maximum/Interval end
  • Interval end only
• Data storage options
  • ASCII text file (.TXT)
  • Comma delimited (.CSV)
  • Microsoft® Excel (.XLS)
  • Microsoft® Excel with template formats

BetaLOG TI runs quickly on most modern Window™ PCs. Minimum requirements are:
• Pentium CPU, 1.0 GHz
• 512 MB RAM
• 5 MB disk storage plus storage for data
• Windows XP Professional, Vista, Windows 7
• Optional Microsoft Excel

BetaLOG TI is provided with the software on CD-ROM media, RS-232 cable, USB/Serial adapter and complete user guide.

![Martel Electronics logo](M4RTEL ELECTRONICS)

TC-100
Precision Thermocouple Calibrator

The TC-100 Thermocouple Calibrator provides high accuracy source and measurement of ten common thermocouples, as well as mV. The TC-100's accuracy of ±0.3°C for Type J T/Cs includes all errors, at resolutions of ±0.01°C or °F in measure mode and ±0.1°C or °F in source mode. Features including MIN/MAX re-call in measure mode, three setpoints per thermocouple range, a large knob for decade control of the output in source mode, and the ability to accept bare T/C wires in addition to mini-plug inputs, makes the TC-100 an accurate, easy-to-use instrument for all your thermocouple calibration needs.

General Features

- High accuracy – ±0.3°C (Type J T/C – all errors combined)
- Ten (10) common T/C types plus mV
- Accepts both T/C mini-plug and bare T/C wires
- Simple decade control of output
- Three (3) setpoints for each T/C type
- MIN/MAX recall in measure mode
- Input protection to 240 VAC
- Supplied as shown with neoprene sleeve case

The TC-100 accepts both
Mini-plug AND bare thermocouple wires

TC-100 Ordering Information

Part Number	Description
1919084	TC-100 Knob-style Thermocouple Calibrator
	Includes • Calibrator as above • User Manual • NIST Traceable Calibration Certificate • Protective sleeve case • Bare lead/TC mini jack connector feature • 9V Alkaline battery
	Optional Accessories
80029	T/C wire kit J, K, T, E w/mini plugs, 3'/1 m length each
80036	T/C wire kit R/S, N, B w/mini plugs, 3'/1 m length each
1919100	TP-KIT thermocouple probe kit (includes 1 ea. of the 6 below listed type K thermocouple probes in hard sided case
80046	TP-K01 bead probe
80047	TP-K02 immersion probe
80048	TP-K03 surface probe
80049	TP-K04 piercing probe
80050	TP-K05 surface probe
80051	TP-K06 air & gas probe

Specifications (1 year at 23 °C ±5 °C; % of reading unless otherwise noted)

Input Voltage	
Range	-10 to +75.000 mV
Resolution	1 µV
Accuracy	±0.007 % of rdg, ±10 µV
Input Impedance	> 1 MegOhm
Output Voltage	
Range	-10 to +75.000 mV
Resolution	1 µV
Accuracy	±0.007 % of rdg, ±10 µV
Output Impedance	> 1 Ohm
Thermocouple Source/Measure	
Types	J, K, T, E, R, S, B, L, U, C
Range	mV
Resolution	
Source	±0.1°C or °F
Measure	±0.01°C or °F
Accuracy	
J	±0.5 °C; -210 °C to -100 °C
	±0.3 °C; -100 °C to +1,200 °C
K	±0.6 °C; -200 °C to -100 °C
	±0.35 °C; -100 °C to +1,000 °C
	±0.5 °C; +1,000 °C to +1,372 °C
T	±0.7 °C; -200 °C to -150 °C
	±0.3 °C; -150 °C to +400 °C
E	±0.5 °C; -200 °C to -100 °C
	±0.3 °C; -100 °C to +1,000 °C
R	±1.8 °C; 0 °C to 250 °C
	±1.0 °C; 250 °C to +1,767 °C
S	±1.8 °C; 0 °C to 250 °C
	±1.0 °C; 250 °C to +1,767 °C
B	±1.7 °C; 600 °C to 1,000 °C
	±1.2 °C; 1,000 °C to 1,820 °C
L	±0.5 °C; -200 °C to -100 °C
	±0.4 °C; -100 °C to +900 °C
U	±0.7 °C; -200 °C to 0 °C
	±0.3 °C; 0 °C to +600 °C
C	±0.4 °C; 0 to °C 1,000 °C
	±0.7 °C; 1,000 °C to +1,800 °C
	±1.2 °C; +1,800 °C to +2,316 °C
CJC Temp. Offset	±0.05 °C/°C outside of 23±5 °C
Warm-up Time	1 minute to specification
Environmental	
Operating Temperature	-10 °C to +55 °C
Storage Temperature	-20 °C to 70 °C
Power Requirements	9 VDC
Battery	9 V alkaline; 006P/ IEC 6F22/ NEDA1604
	Optional NiCad
	Optional AC adapter/charger
Mechanical	
Dimensions	5.7" H x 3.15" W x 1.43" D (144.7 x 80.0 x 36.3 mm)
Weight	12 ounces (340 grams)

Notes:
1. Temperature standard ITS-90.

Temperature Probes & Kit

A variety of temperature probe configurations are available for use with Thermo-couple Calibrators.

All are Type-K, and feature ±2.2 °C/±0.75% or ±3.9 °F/±0.75% accuracy.

TP Kit includes probes:
TP-K01 through TP-K06

TP-K01 — Bead Probe
-50 °C to 200 °C; -58 °F to +392 °F

TP-K02 — Immersion Probe
-50 °C to 700 °C; -58 °F to +1,292 °F

TP-K03 — Surface Probe
-50 °C to 400 °C; -58 °F to +752 °F

TP-K04 — Piercing Probe
-50 °C to 600 °C; -58 °F to +1,122 °F

TP-K05 — Surface Probe
-50 °C to 400 °C; -58 °F to +752 °F

TP-K06 — Air & Gas Probe
-50 °C to 800 °C; -58 °F to +1,504 °F.

See ordering information table on previous page.

IVC-222HPII
Precision Voltage/Current Calibrator

The Martel Electronics IVC-222HPII Voltage/Current Calibrator is a general purpose current and voltage source that can be used in engineering, manufacturing, test, and process control applications. It combines both digital and analog circuitry to achieve its rated specifications in a small, reliable package.

The IVC-222HPII has the capability to store and recall up to two setpoint values, the SP1 and SP2 keys. An RS-232 port accessed via a custom cable (available from Martel) allows the calibrator to be computer controlled for automated testing.

General Features

- Remarkable 0.015% of reading accuracy
- Four ranges: 200 mV, 2 V, 20 V and 24mA
- Intuitive, easy-to-use controls
- RS-232 interface allows computer control
- Built-in 24 V supply can drive 4 to 20 mA loops over 1,000 Ohms
- Rugged, lightweight, hand-held unit
- Includes test leads, carrying case, 9 V battery, NIST
- Full rubber boot with optional carrying case
- Certificate, and instruction manual

Specifications

Output Range	
Voltage	200 mV, 2V, 20V
Current	24 mA
Resolution	
Voltage	0.01mV, 0.1 mV, 10 mV
Current	0.001 mA
Accuracy	± 0.015% of reading, ±2 count; 18°C to 28°C
Temp. Stability	± 0.005% FS°C
Load Capability	
Voltage	±1 mA for rated accuracy
Current	1,000 Ohms
Capacitive	no limitations (voltage mode only)
Output Protection	Current limited internal RESET
Power Supply	9 volt alkaline battery or optional NiCd
Mechanical Dimensions	
Size	1.43"h x 3.15"w x5.7"d
Weight	12 ounces

IVC-222HPII Voltage/Current Source Calibrator Ordering Information

Part Number	Description
19D1991	IVC-222HPII Voltage/Current Source Calibrator
	Includes • Calibrator as above • User Manual • NIST Traceable Calibration Certificate • Protective sleeve case • Fixed test leads • 9V Alkaline battery

MS-420 - *Mini-source Portable Calibrator*

The Martel Electronics MS-420 Mini-Source Portable Calibrator is a multi-purpose process loop tool that offers high accuracy in an ultra-small, rugged package.

A single pushbutton selects one of five current outputs (4, 8, 12, 16, or 20 mA), which can drive up to 300 Ohms, or can act as a 2-wire simulator with an external loop power supply of up to 30 VDC.

Each unit is provided with a 9 V battery, NIST Certificate, and instruction manual.

Specifications

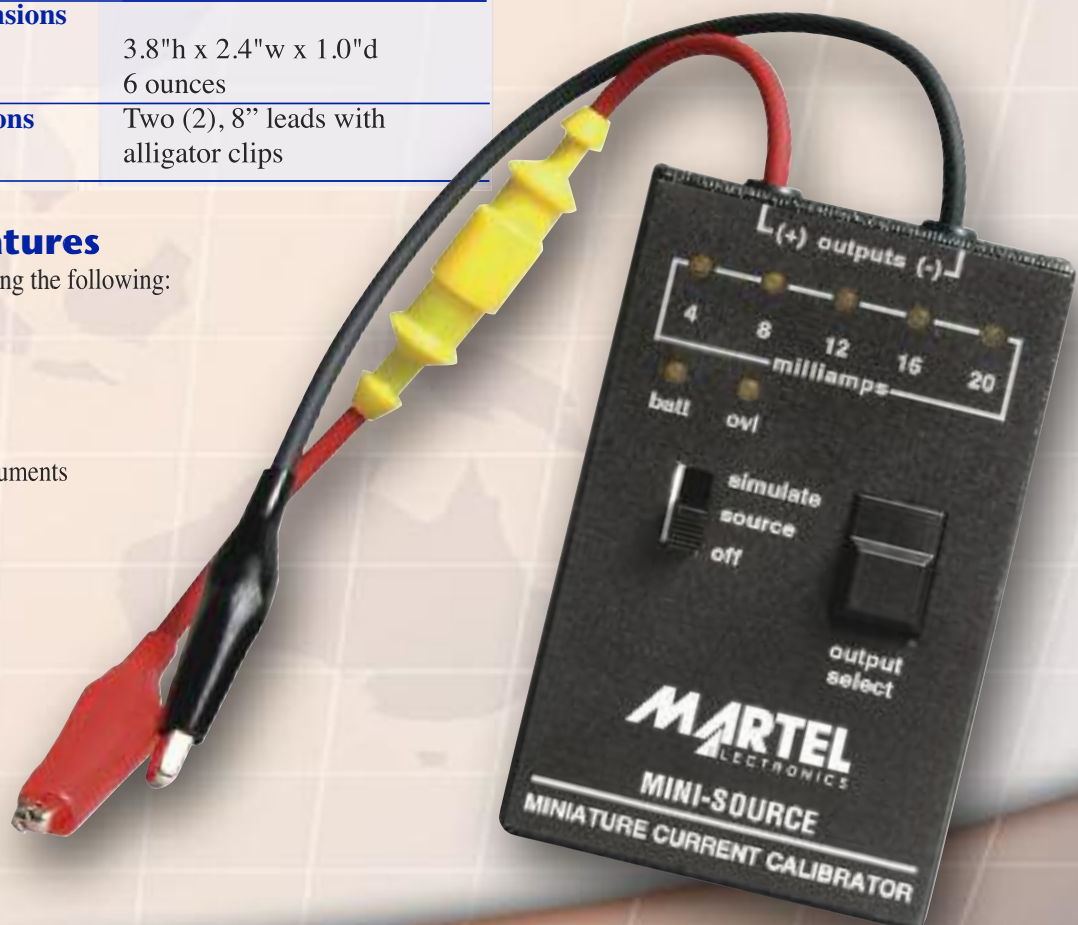|	
Output	Five current steps: 4, 8, 12, 16, and 20 mA
Accuracy	± 0.075% of FS
Voltage Compliance	
Source	Internal 9 volt battery
Simulate	External supply; up to 30 VDC
Power Supply	9 volt alkaline battery
Battery Life	50 Hours @ 4 mA output
Temperature Range	
Operating	0°C to +50°C
Storage	-25°C to +60°C)
Mechanical Dimensions	
Sizes	3.8"h x 2.4"w x 1.0"d
Weight	6 ounces
Output Terminations	Two (2), 8" leads with alligator clips

MS-420 Mini-source Current Calibrator Ordering Information

Part Number	Description
19D4132	MS-420 Mini-source current calibrator
	Includes • Calibrator as above • User Manual • Calibration Card • Fixed test leads • 9V Alkaline battery

General Features

Designed for calibrating the following:

• Chart recorder

• Panel meter

• Data acquisition

• Other process instruments

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Calibration Technology Starts Here

BETA
CALIBRATORS

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Specifications subject to change without notice.